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FOOD MANUFACTURE

PUBLISHERS: LEONARD HILL, LTD., 231, STRAND, W.C.2 OCTOBER, 1934

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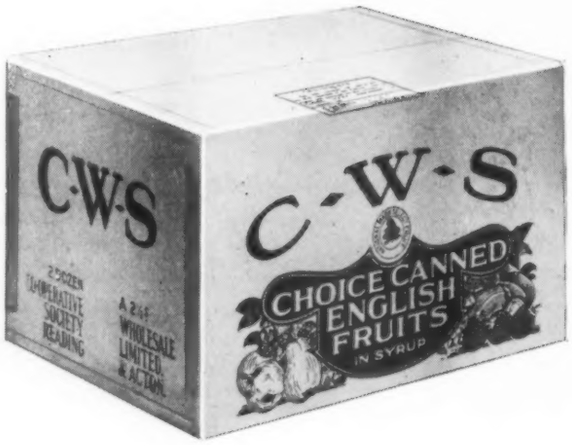

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FOOD MANUFACTURE

Incorporating Canning, Packing and Preserving.

Volume . . . IX
Number . . . 10

OCTOBER . . 1934

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SUBSCRIPTION

Single Copies - 1/-
Annual Subscription
12 Issues - - 10/-

Published on the first day of the Month by
LEONARD HILL LIMITED
231, STRAND, LONDON, W.C.2
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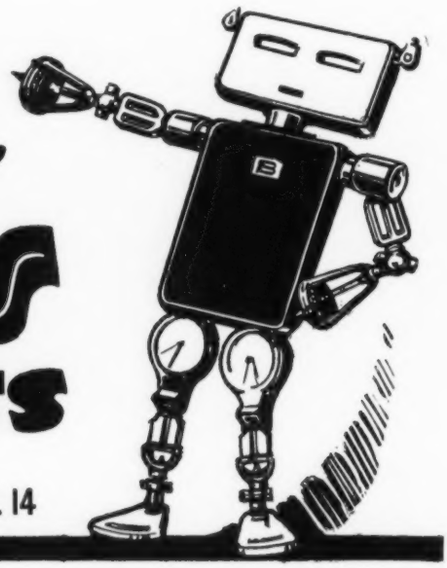

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FOOD MANUFACTURE

Vol. IX, No. 10 October, 1934

Production Census

THOSE OF a statistical turn of mind, either from birth or necessity, will hail the appearance of the Final Report on the Fourth Census of Production (1930). More than one-third of its 530 pages deal with the food and drink trades, the remainder being devoted to tobacco, chemicals, paper, and printing.

To most food manufacturers the section on preserved foods will probably appeal with greatest interest, although many will be disappointed to find that related products have not been further separated, as for instance is the case with marmalade, jams, and fruit jellies, or blancmange, custard, and similar powders. Nevertheless, it is the best information that is open to the ordinary person.

The food section is divided up into grain milling; bread and biscuit; cocoa and sugar confectionery; preserved foods; bacon curing and sausage; butter, cheese, condensed milk, and margarine; sugar and glucose; fish curing; cattle, dog, and poultry foods. In each case essential information is given about such matters as production, prices, exports, imports, employment, wages, power consumption of fuel, and so on.

Clarification of Wine

Since U.S.A. threw prohibition overboard it is interesting to note the sudden spate of technical literature on brewing and fermentation problems. Chemists are apparently making a bold bid for recognition as America's future "beer barons."

Especially is the production of wine receiving scientific attention, and Professor Cruess and his associates at Berkeley, California, are well to the front. Thus L. G. Saywell, of the California University, has recently probed into the problem of how best to overcome the clouding of wine. He points out that in relation to Californian wines, many European products are high in tannin and acidity, while certain Australian wines are markedly low in tannin. As a result, wine types that may be stable in France may develop a cloud in California or Australia.

He finds that previous practice in California of utilising gelatin, egg white, isinglass, and tannin as clarification or fining agents is inadequate. As a result of investigation, Saywell concludes that the appropriate use of bentonite results in a brilliantly clear wine which is stable to higher and lower changes in temperature, to sunlight, and to storage at room temperatures.

The R is in the Month Again

"Falling leaf and fading tree" was Tosti's lament as summer merged into winter through the mist and mellow fruitfulness of autumn, but even though we do not herald the fall of the year with the same cheerfulness as Gilbert welcomed "the flowers that bloom in the spring, tra-la," there are compensations. We have "autumn's red-lipped fruitage blushing through the mist and dew." We have visions of log fires and hot potato cakes soaked in butter, hopes of skating and thoughts of Twickenham, but, above all, the R's are in the month again and once more we can negotiate the nimble oyster with relish and avidity. The oyster season opened on September 1 with, we are told, very good prospects. Large quantities of oysters reached London early in the day and, although the weather was not cold, they found a ready sale. They were mainly of the Whitstable-Brittany variety; Brittany oysters that have been relaid at Whitstable, and to our great satisfaction were being sold at prices somewhat lower than last year's. We hope that out of the estimated 15 million from Whitstable alone our slender purse will be able to rise to a few dozen at least! We are informed that natives are very scarce, as are also American relaid blue points, but there will be plen-

tiful supplies of direct imported blue points in a week or two and these will be cheap. There are large quantities of Portuguese oysters relaid at Brightlingsea, and these are being sold as "certified oysters." At Colchester the official opening of the oyster season does not take place until the end of September or early October and that means that the supply of natives will again be short. At Whitstable, Colchester, and Helford (where the Prince of Wales has encouraged cultivation) many oysters have been relaid, and it is hoped that in a year or two plentiful supplies will be available at prices within the normal pocket's reach.

Vegetable Drying

As an example of the extent to which vegetable drying is carried out in California, it is interesting to note that at one of the dehydrators turning out vegetable powders and flakes, some 26 different vegetables or allied green stuffs, in addition to kelp, are treated. The flaked products are used mostly for food and sold to restaurants, cafeterias, and packing houses.

This particular factory has four dehydrators, each holding 21 trucks of 14 trays each. The trays measure 3 × 4 ft., and the length of the dehydrators is 32 ft., with a width of 10 ft. and a height of 6 ft. The dehydrators are built of galvanised metal and the walls are well insulated. Heating is by gas and air-circulation is induced by 40-in. diameter fans, giving an air velocity of 750 lin. ft. per minute. The 24-hour capacity of the four dehydrators is 20,000 lb. of fresh products.

Mushrooms

In response to the recent revival of interest in mushroom cultivation, Dr. W. F. Bewley, of the Experimental and Research Station, Cheshunt, Herts, and J. Harnett, of Hoddesdon, Herts, have just produced a small book describing in considerable detail the various processes which must be carried out from start to finish and the precautions which must be taken to produce a good commercial crop free from damage by diseases and pests. It is certain that this handy little book by recognized authorities will be welcomed by the large number of people who are nowadays interested in this field of enterprise.

Formaldehyde in Canned Fish

On various occasions shipments of kippered herring from Norway have been condemned in U.S.A. on the claim that formaldehyde was used as a preservative, in spite of denials by the packers. Accordingly, Dr. G. Lunde and E. Mathiesen of the Stavanger research laboratory have turned their attention to the question of the origin of this formaldehyde content.

Their work has not led to definite conclusions, but it would appear that most, if not all, of the formaldehyde is of natural origin, although the amount found in the canned food is somewhat higher than in the fresh fish. Formaldehyde has been detected in the distillate from both fresh and canned herring, crab, and other marine products. Its formation in canned fish appears to be independent of the nature of the container and does not increase during long storage. Moreover, formaldehyde is found in the aqueous extract of canned fish without distillation.

In connection with this work, it was found that only the Hehner test for formaldehyde could be satisfactorily applied directly to an aqueous extract of the fish, but that all tests can be used upon the distillate from an acid distillation.

Shortening Values

Continuing the work of J. D. Fisher on the shortening value of fats, reported in *Ind. Eng. Chem.*, 1933, p. 1171, J. F. Cawood, of the Institute of American Meat Packers, Chicago, now gives the results of her investigations into the question as to whether the comparative shortening values determined by the Bailey shortometer indicate the relative amounts of the several fats that can be used to produce pie crust of equal tenderness and whether the comparative shortening values of the different types of fats are affected by the type of flour used.

From his work Fisher showed that, using pie-crust wafers and 41 to 44 per cent. of fat, five lards, two hydrogenated oils, a hydrogenated lard, an animal stearin-vegetable oil compound, and an all-vegetable oil compound gave values by the Bailey shortometer which agreed closely with their congealing points.

Lard the Best

Miss Cawood reports that the shortening equivalence by weight of fats in pie-crust formulas cannot be directly calculated from the relative shortening values determined at one level of fat by means of the shortometer. The amounts of fats which show equal shortening results must be determined by trial, but in general they bear a close relationship to the relative shortening values. It was also found that six fats incorporated into wafers and deter-

mined for breaking strength fell into the following order: Lard, vegetable oil compound, hydrogenated lard, a hydrogenated cottonseed oil, animal stearin with vegetable oil compound, and a hydrogenated cottonseed oil. While the figures for comparative shortening value are not identical with those in studies made using pastry flour, they are of about the same magnitude and in the same order.

Pilchard Oil

Discussing the uses of hydrogenated pilchard oil, F. Charnley of the Prince Rupert Experimental Station, B.C., states that it is possible to prepare from this oil a satisfactory product for use as shortening. Such a product, made from a properly refined pilchard oil and treated with superheated steam to remove the "hydrogenated" odour and flavour, is a clean, white, odourless, tasteless fat possessing a high smoking point and good shortening and keeping qualities.

Wheat Prospects

The situation as to prices and supplies of wheat is creating widespread interest. At any rate, after all the discussions of experts from a score or more nations there should be no doubt about the fundamental facts, and this year there is ample authentic statistical information to allow for accurate forecasts. One thing appears clear; the failure of the North American wheat crop makes it possible to bring into commerce some of the surplus stocks accumulated during previous seasons. It is also apparent that the price of other cereals will rise in sympathy with wheat. Apart from the recent sharp rise in the price of wheat—due entirely to speculators—wheat is only a little dearer than it has been for some time. There can be no possibility of a world shortage as stocks are enormous, and production even in bad years is equal to or more than demand. Improved methods of culture, the better understanding of artificial fertilisers, which to use and when, and careful breeding of new varieties of wheat, are resulting in increased production all round, and this increase will be progressive for many years to come. When we realise that the average yield per acre in Australia and Argentine over a number of years was only $6\frac{3}{4}$ cwt. per acre against 21 cwt. per acre in Holland, we can understand how much more potential wheat there is in the world than is actually grown at present. As we see it the situation offers no difficulties; there is no need for panicky buying and selling, and the world is assured of a plentiful supply of its daily bread for years to come.

Up-to-date Harvesting

On some land not far from Salisbury we recently came across an example of mechanical harvesting. On this farm—a quite new venture devoted entirely to wheat and barley—two combine harvesters (neither English made) were at work. At the time of this visit the harvesters were dealing very effectively with barley. In the old way the work would not have been easy as the barley was very short in the straw, and with a strong wind blowing the heads were sometimes nearly on the ground. The combines missed nothing, however, and the grain was running through to the sacks in excellent order. As to labour, one man was driving and another looking after the sacks.

This year's wheat conditions have been so satisfactory that the grain is fit to market without going through the drying plant, which is, however, provided in case of a wet season. This venture of devoting some 1,500 acres of land to wheat and barley is due to the initiative of an Australian, who is attracted presumably by the wheat subsidy and the high prices of malting barley. After one year he has some 700 acres under corn, and as every operation is mechanised and as the Government has put quite a fictitious value on English wheat the venture is likely to prove profitable.

Repercussions?

Leaving this mechanised unit and passing over Salisbury Plain we saw other farms with their full complement of men, horses, and wagons. Sheaves were being taken to a rick that ultimately will be thatched and finally pulled down again to be threshed. Obviously the first method is more economical and efficient, but the second means more employment. The wheat farmer was given his subsidy presumably to help him pay for the labour involved in English methods of wheat farming. What is going to happen to the agricultural labourers if everything is mechanised? Is the wheat subsidy doing any real good to English agriculture if one of its main results is to attract speculative farmers to put down thousands of acres of wheat to be marketed at an uneconomic price with practically no labour at all, merely to scoop the Government's bounty on wheat? We very much doubt whether these extra acres would be put under wheat if it were not for the subsidy, and while we are not for one moment condemning mechanised methods and have always advocated

up-to-date ideas, we fail to see how the subsidy is helping the English farmers if it is merely attracting speculative wheat farmers to apply mass production methods with the elimination of the farm labourers. The former will make fortunes out of the bread eater, the latter will face ruin.

The Wheat Conference

At long last there appears to be a possibility that the International Wheat Agreement may be saved, and the position has changed considerably since we wrote about it in our August issue. Then it did not appear that any solution was in sight and the position seemed hopeless, but now there is a chance that it may be prolonged for a further two years. It has been nominally in force for just over a year and under the original terms is due to expire at the end of July next. It certainly has had a chequered career. The difficulties that prevented its smooth running were discussed by the Advisory Committee in Rome last May. It was then suggested that the quota system (which had failed owing to a bumper crop in Argentina) should be reinforced by a minimum price. Argentina refused to accept this suggestion, although it was supported by all the other wheat exporting countries. The Rome meeting ended with nothing done.

More Hopeful

The discussion was resumed at the prolonged sittings which have just ended in London, and again it was impossible to reach any conclusion, but this time amendments were drafted which should make the Agreement more effective as well as easier to work. Before adjourning the Committee decided to report to the twenty-one signatory Governments and to urge that instructions be given to their representatives, enabling them to reach a final agreement at the next meeting, which has been fixed for November 20 in Budapest.

More Elasticity Needed

A breakdown of the Wheat Agreement—which after all is about the only tangible result of the World Economic Conference—would be a pity. It would be a tacit admission of the failure by international co-operation to put wheat production on a steady, remunerative basis with a balance of supply and demand which would avoid the overproduction which causes ruinous prices to farmers or the under-production that brings onerous prices to the consumer. It is now clear that as originally suggested the scheme is unworkable, and one realises that a system of allocated exports can only function effectively if it is elastic enough to provide for unforeseen contingencies such as the recent heavy crop in the Argentine and the drought in North America. The amendments now proposed would substitute quarterly for annual allocations, and would provide a reserve quota to be allotted as occasion demands. We hope that the Governments concerned will weigh these suggestions carefully because if the Agreement collapses chaos in wheat production will surely follow.

De-natured Wheat

The system adopted in France whereby wheat which is not to be milled for human consumption is de-natured with eosin or methylene blue has been causing trouble, and some unscrupulous millers have been using this for ordinary milling purposes and thereby avoiding duty payments. There have been a number of attempts to detect this, and, according to Gicquel, small particles of the dyes are detached from the bran during milling and remain in the flour, where they may be detected. Meyer has developed a technique whereby the colouring matters may be found. About 30 gm. of flour are spread out in an even layer on a glass plate and compressed in the same way as a Pekar test is carried out. The surface is moistened with a mixture of alcohol, glycerin, and water. In a short time traces of colouring matter become plainly visible. The use of eosin apparently does not have any harmful effect on health. According to Wagner, it has been fed in fairly big doses to fowls without injury. It has been shown that toxic symptoms following the feeding of eosinised wheat and attributed to the dye were in reality caused by the presence of weed seeds, particularly corn cockle.

Beverages for Health

Dr. Walter H. Eddy, of New York City, an international authority on physiological chemistry, will speak on the health values of bottled carbonated beverages at the Annual Convention and Exposition of the American Bottlers of Carbonated Beverages, in Buffalo, N.Y., November 12 to 16.

Dr. Eddy will discuss vitamin values of certain types of beverages, their sugar content, and the rôle of the bottled carbonated beverage in reducing diets and in calcium utilisation. He will review certain experimental work on these subjects and will present data and suggestions which will be new and extremely helpful to the manufacturer of bottled carbonated beverages.

The Treatment of WASTE WATERS in the FOOD INDUSTRY

By THOMAS McLACHLAN, A.C.G.F.C., F.I.C.

ALTHOUGH MANY food manufacturers have their factories in large towns and are able to discharge their waste waters into the municipal sewers without trouble to themselves, there are others who are not so fortunately placed. With the present tendency to erect factories outside towns and beside rivers or railways, the question of the disposal of waste waters becomes increasingly difficult and is a problem which should be taken into account by every manufacturer considering the site for the construction of a new works.

It has been pointed out in the Second Report of the Joint Advisory Committee on River Pollution that the Public Health Act, 1875, obliges every sanitary authority to provide proper sewers for their district and entitles every owner or occupier of premises within the district to empty his drains into those sewers, subject to giving due notice and complying with the regulations of the local authority. The effect of this Act was, however, largely nullified by the passing of the Rivers Pollution Prevention Act, 1876, which compels local sanitary authorities to grant facilities to manufacturers to discharge liquid effluents from their factories into those sewers. At the same time it enables authorities to refuse acceptance of the discharge of any effluent liable to injure the sewer, to affect sewage purification, or to prejudice the disposal of the products obtained from the sewage. It has been held in the Courts that the 1876 Act is the one which in reality controls the liability of the local sanitary authority and that, if they can show that a water is likely to have any injurious effect, they may refuse to accept it in their sewers. Certain local authorities have their own Corporation Acts, by which they are obliged to accept any waste from any factory subject to necessary financial arrangement with the owners of the factory for the requisite additional treatment of waters or for the cartage of solid matter removed from the water before its discharge into the sewer.

There may be some who would question the possibility of upsetting a large sewage system by effluents from a food factory in view of the similarity of the products discharged from such a factory and from private houses. To these I would instance the interesting case which occurred in Chicago in 1927, when it was found that the activated sludge was apparently losing its activity and that a filamentous growth with an inhibitory effect on the normal flora was permeating it. On examination of the sewage liquors it was found that the water contained a considerable amount of sugar, and this was eventually traced to the large number of illicit stills which had been erected in a certain part of the city. In a law-abiding country such as ours one cannot but smile that large installations of this kind could only be detected by such means.

"Standard" Effluents

Although the Rivers Pollution Prevention Act laid down no standards as to what might or might not be discharged into rivers, the recommendations of the Royal Commission on Treatment and Disposing of Sewage are usually accepted either in practice or for legal purposes. According to these recommendations, a standard effluent is one containing not more than 3 parts per 100,000 of suspended matter and not absorbing more than 2 parts per 100,000 of oxygen by the five-day biological test. When the flow of the water in the stream compared with

(Courtesy, Messrs. Tuke and Bell, Ltd.)

Complete Bacterial Treatment Plant, showing Tanks, and on the right a Revolving Distributor.

that of the effluent varies from 150 to 300, suspended matter should not be more than 6 parts per 100,000; with a dilution between 300 and 500 suspended matter may be 15 parts, and with a dilution of more than 500 all tests may be dispensed with, provided that screens are inserted to remove obvious suspended matter. These recommendations are naturally controlled by the number of such effluents being discharged, since the cumulative effect must be considered and not merely the effluent from each factory individually. The question must also be borne in mind of the possibility of contaminating any water supplies which are already being drawn lower down the rivers for domestic or any other purposes. Finally, when discharging wastes into rivers, manufacturers would do well to remember that present-day standards of hygiene are higher than those of 1876, and that they are likely to be still further stiffened, so that when making allowances for the discharge of waste waters into a sewer or stream one has to bear in mind not only present legislation and the estimated immediate quality and quantity of effluent, but also possible future legislation and possible development of the factory owing to increased sales.

Types of Waste

The wastes from food factories tend to fall into three classes, according to the chief constituents of the waste, but the most troublesome effluents are those containing an appreciable quantity of carbohydrates as cellulose, starch, or sugar. This first group includes effluents from factories for the preparation of beet sugar (and to a certain extent cane sugar), jam, starch, grain of any type, malt, beer, and spirits.

The second group includes wastes containing an appreciable amount of protein, together with larger or smaller quantities of fat, and is derived from the manufacture of gelatine, bone boiling, tripe dressing, etc., and the slaughter of animals. The third group comprises effluents of a mixed type arising from the manufacture of cheese and from dairy refuse. The effluents from packing-houses will fall into one or other of the above groups according to the type of product being packed. In the meat-packing industry the complete utilisation of all raw material and the consequent elimination of waste has become proverbial, but in other packing industries, such as those handling legumes and vegetables, there is a considerable amount of waste water.

The various forms of treatment adopted fall roughly into three classes, which may be further subdivided:

(1) Screening and sedimentation to remove solids.
(2) Chemical treatment.
(3) Fermentation by micro-organisms.

Screening

This may take place through three types of filtering material: (*a*) Coarse, which is 1-inch mesh; (*b*) medium, which is ½-inch mesh; and (*c*) fine, which is ¼-inch or perhaps less in mesh. The choice of screens will depend largely on the type of suspended matter to be removed. Most inorganic suspended matter can be dealt with in settling tanks, which are so arranged that they allow for approximately a four-hourly flow, and in the absence of colloidal material most of the organic suspended matter will settle in these tanks. If the amount of colloidal matter is very great, a considerable quantity of suspended matter will be retained in the water, and it may even be impossible to purify it directly by means of bacterial fermentation without preliminary treatment or a second fermentation.

Chemical Treatment

It is sometimes the custom to add lime to the water to make it alkaline, and in this case it has been found that the optimum alkalinity for coagulation of solids shows a *p*H of 11·0, but it has been discovered that such a liquor does not ferment readily, as the alkalinity renders it sterile and tends to keep it so. Another method of chemical coagulation which is sometimes employed is the addition of alumino-ferric, which is impure aluminium sulphate, followed by a small quantity of soda, causing the precipitation of aluminium hydroxide, which carries down with it the suspended and colloidal matter. In certain cases where hydrogen sulphide has been produced, ferrous sulphate or ferric sulphate or chloride are added in order to remove the odour.

These forms of treatment may all be used, including the lime method, mentioned first, if the waste is to be discharged into a stream, as there will be sufficient carbon dioxide in the water to neutralise any excess of lime, and, moreover, the quantity of lime can be adjusted to meet the capacity of the stream water. In general it has been found that it is best not to treat waste waters with any chemicals, if they are derived from food factories and are to be treated by any subsequent fermentation processes to purify them, but that a better form of treatment, if they are too strong, is to dilute them either with stream or effluent water and then to submit them to fermentation. In any case one has to consider local conditions as to whether chemical treatment is to be adopted or not. If one is discharging the waste direct into a river or stream or into the municipal sewer, local authorities may require that it be treated before leaving the factory, and this may be particularly important in the case of discharging into a stream, where odour and suspended solids are important factors. One advantage of the chemical treatment of water is that it does not affect the chemical composition of the dissolved constituents of the waste, although it has such a definite action on the suspended matter, unless, of course, the chemicals added enter into reaction with any of the dissolved matter of the waste. This means that, once the clarified liquor comes into contact with suitable micro-organisms or those present are given a suitable opportunity, purification will be effected quite readily.

Another chemical which is being employed in increasing quantities for the treatment of waste liquors is chlorine, which is usually added to a clarified water after coagulation and sedimentation of suspended matter. Chlorine has a double action on wastes; the first is probably the most important in certain industries, in that the liquid is sterilised and rendered suitable for subsequent treatment by micro-organisms. It stands to reason that micro-organisms which like an alkaline medium will have

great difficulty in thriving when confronted with an acid one, but if this acid liquid is heavily charged with antagonistic organisms purification will be made more difficult, and it will be appreciated that certain liquors, such as those from dairies, may be fermented more effectively after a preliminary treatment with lime or chlorine. Clorine has another action in that it partially oxidises some of the organic matter present in the waste. It should be remembered that, since chlorine is a steriliser, it must not be discharged into a sewer in the free state, and that sufficient time should be allowed for it to react completely in order to obtain the best results.

(Courtesy, Messrs. Tuke and Bell, Ltd.

A Filter Bed with a Revolving Distributor.

Septic Tanks

Some years ago it was suggested that sewage and waste waters should be treated in what were termed septic tanks, as it was felt that such a method of treatment allowed a larger quantity of suspended organic matter to be taken into solution. It was also found that water treated in the septic tank absorbed less oxygen, when tested by the four-hour oxygen test, than did the original crude sewage. As oxygen is excluded from the water in the septic tank, it will be appreciated that this purification is apparent rather than real. The resulting products are deprived of all their oxygen, so that, when discharged into a stream, they immediately deprive it of all its dissolved oxygen, with deleterious effects on any fish and other forms of life which may be present. Moreover, particularly when wastes from the food industry are considered, the septic tank leads to the formation of stable products, such as acetic, lactic, and butyric acids, which are not so readily attacked by aerobic bacteria as the original organic matter, proteins, sugar, etc., with the result that subsequent purification is more difficult than by other processes. Another disadvantage of the septic tank is the production of odours, such as hydrogen sulphide.

Percolating Filters and Activated Sludge

There is no doubt that the best method at present at our disposal for treating any waste water from food factories consists in oxidising the organic matter by means of aerobic bacteria and other micro-organisms. It has been found that the micro-organisms responsible for the aerobic purification of effluents are none other than the organisms commonly termed "soil bacteria," and that they include various species of micro-organisms, including bacteria, fusaria, yeasts, chytridineæ, algæ, protozoa of all types, rotatoria, nematodes, and oligochætes. The essential difference between a percolating filter and the activated sludge process is that in the former the fluid trickles slowly over a mass of pebbles, granite, clinker, or other material to which the growth containing the various organisms is attached, so that one side of the liquid film is in intimate contact with micro-organisms, while the other surface of the thin film is directly aerated, whereas in activated sludge the mass ferments in troughs which are aerated both by self-exposure during fermentation and by air blown in from fine jets distributed throughout the system. For waste containing a low percentage of carbohydrate, but a comparatively high percentage of protein, the activated sludge process is efficient, but sugar requires more than twice as much oxygen for its combustion as protein, and difficulty is consequently experienced in treating waste liquors containing a high percentage of carbohydrate by this method. It will be remembered that it was the interference of sugar with the activated sludge which led to the detection of the illicit stills in Chicago mentioned earlier. Of all food industry wastes those which give most trouble emanate from the beet-sugar industry, jam manufacture, and dairies, on account of the high sugar content. Wastes from dairies should not be as troublesome as those from the various sugar industries, on account of the usually higher protein content derived from milk. At the same time the fat present in dairy wastes probably interferes with efficient aeration and increases the difficulty of fermenting these fluids.

In every type of waste purifier, sedimentation tanks, and also usually screens, are required to remove the larger and heavier pieces of suspended matter and, as far as possible, inorganic suspended matter. The liquid is then run into balancing tanks, so that filters are not fed at one time with a strong liquor and at another with comparatively clean water. Sometimes two balancing tanks are erected side by side and the contents from both tanks admitted to the filter of a sludge tank in definite proportions by mechanical arrangements. If the temperature of the waste is high, more than the normal time of four hours may be required for the passage of the fluid through the settling and balancing tanks; but the temperature may be reduced more rapidly by altering the construction of the settling and gauging tanks in order to expose a greater surface to the cooling action of the outside air.

When fermentation has proceeded to a considerable

degree before the waste can reach the filter beds it may be necessary to treat with lime in order to reduce the acidity or to sterilise by the addition of lime or chlorine, so as not to interfere with the normal flora of the beds. In the case of lime treatment, it is preferable to add the lime before passing through the settling tanks, in order to save a further process for its elimination.

Percolating filters are usually constructed as round tanks, fitted at the base with bricks or earthenware channels to enable the filtered effluent to collect and to be run away as required. Above these channels the filtering medium may be placed to a depth of 6 to 8 ft., and a rotating arm which is usually actuated by a gravity feed ensures even distribution of the influent over the whole. A filtering medium must not be friable, as the friction of the running water might disintegrate it. It must be of such a chemical composition that it will be unattacked by the acidity or alkalinity of the incoming liquor, and finally it should possess a fairly rough surface in order to prevent sloughing of the filaments when conditions are abnormal. Crushed granite, quartzite, or similar materials appear to be the most satisfactory. The size of the filtering medium has to be considered, and stones ranging from $\frac{1}{8}$ inch to 2 inches are employed, but, if the filter is to be worked more or less continuously without risk of pooling, it is probably better to use larger material

TABLE I.

	Influent.	*Filter Effluent.*	*Final Effluent.*
Parts per 100,000—			
Total solids	244·0	186·0	182·0
Suspended solids	38·1	19·6	16·4
Volume suspended solids ..	37·6	16·4	13·6
NH_3 free and saline ..	3·8	0·18	0·23
Albuminoid ammonia ..	3·6	1·6	1·4
5-day biological test ..	62·8	8·7	5·2
N_2O_3	—	0·14	0·13
N_2O_5	—	0·30	0·27
*p*H	7·1	8·1	8·1

Normal pollution reduction 80 per cent. or more.

of 1 to 2 inches in size. In deciding on the rate of flow and size of a percolating filter one has to consider the ratio of the biological oxygen demand of the material loaded against the biological oxygen reduction per unit of volume. Ruf and Warwick in America have shown that for milk wastes 80 cubic feet of rock are required for every pound of biological oxygen demand. Thus when dealing with a waste from a condensery handling 163,000 lb. of milk daily they found that a filter 45 feet in diameter and 8 feet in depth was sufficient to bring about the purification of an influent as shown in Table I and to effect a purification of about 86 per cent.

Richards and Cutler, working on beet-sugar wastes, found that filters 25 feet in diameter and 6 feet in depth were capable of handling 25,000 to 30,000 gallons of influent liquors per day. They found that it was advisable to work on crude liquors containing not more than 0·1 per cent. of sugar, although solutions containing up to 0·5 per cent. may be handled with impunity by the filters. It is, however, preferable to dilute the more concentrated fluid with river or effluent water and to run it more rapidly over the filter, as the speed of oxidation is more than five times as rapid when the sugar content is between 0·07 and 0·1 per cent. than with a liquid containing 0·5 per cent. The extent of purification obtainable with jam liquors, mangold liquors containing sucrose, and beet-sugar liquors is shown in Tables II, III, and IV, based upon those of Richards and Cutler.

TABLE II.—SAMPLES OF JAM FACTORY WASTE.

	Crude Waste Water.	*Filter Effluent.*
Parts per 100,000—		
Total solids	383·6	119·6
Loss on ignition ..	273·6	24·0
Ash	110·0	95·6
Solids in suspension ..	71·4	6·8
Loss on ignition ..	48·4	4·8
Ash	23·0	2·0
Solids in solution ..	312·2	112·8
Loss on ignition ..	225·2	19·2
Ash	87·0	93·6
Ammoniacal nitrogen ..	0·11	0·14
Organic nitrogen ..	2·63	0·43
Nitric nitrogen	Nil	0·06
Total nitrogen	2·74	0·63
Oxygen absorbed in 4 hours	121·92	2·16
Dissolved oxygen taken up in 5 days	Over 300	5·16
Sugar (sucrose)	Much	Nil
Incubation test, odour..	Putrid H_2S	Unpleasant
Reaction	Acid	Alkaline
Appearance and odour..	Turbid, unpleasant fruity odour	Slightly turbid, little odour

TABLE III.

	Mangold Liquor + 0·1 Per Cent. Sucrose.	*Filter Effluent.*
Parts per 100,000—		
Total solids	202·5	—
Loss on ignition ..	179·0	—
Ash	23·5	—
Solids in suspension ..	6·25	Nil
Loss on ignition ..	5·35	—
Ash	0·9	—
Solids in solution ..	196·2	52·15
Loss on ignition ..	173·6	22·85
Ash	22·6	29·30
Ammoniacal nitrogen ..	0·24	0·02
Organic nitrogen ..	1·35	0·35
Oxygen absorbed in 4 hours	59·68	1·07
Dissolved oxygen taken up in 5 days	104·52	0·91
Nitrous nitrogen ..	Nil	Nil
Nitric nitrogen	0·02	0·24
Sucrose	100·0	Nil
Incubation test, odour..	Strong acid, sometimes putrid	Sweet
*p*H	4·1	8·0
Appearance and odour..	Turbid, rancid smell	Clear, sweet earthy smell

(*To be continued.*)

The Manufacture of Continental Sausages

By PETER SALOMON, Diploma Engineer*

Hard Sausages (Dried Sausages)

THE PRINCIPAL difference between these sausages and the other kinds already described consists in the drying of the filling, thus making the sausage hard and lasting. The chief members of this category are:

Salami Sausages,
Cervelat Sausages,
Schlack Sausages,
Polish and Garlic Sausages.

The filling material for these sausages is made from a roughly chopped mixture of meat and fat cubes. The meat is first hashed on the mincer and at the same time the fat cubes are prepared in the fat cubing machine.

The manufacturing of the mix for the hard sausages has to be conducted most carefully if a really hard product is to be obtained. Failures in the procedure usually appear after several weeks, when the sausages can be seen not to have become hard and lasting. Also greasiness of even small quantities of the meat, caused by the heat of friction through the work of the knives during the hashing process, must be prevented in every case.

Therefore it is advisable not to carry out the final hashing in the bowl chopper, because there is a special danger of greasing on this machine. Either the rocking chopper or the cylinder chopper, which have already been described, should be used for this purpose.

Since the mix must be filled into the skin without leaving any hollow spaces, presses are sometimes used in order to compress the filling before it is placed in the stuffer.

FIG. 1.—Automatic Stuffing.

FIG. 2.—Wheeling the Trolleys into the specially constructed Processing Room.

A dried sausage of a high quality must fulfil the following conditions: The skin must be dry without having a parchment-like structure or any tendency to become greasy, and must also be easily separable from the filling. The meat should be of a reddish colour, without a grey residue in the centre; further, the whole sausage must become entirely hard. Hardness and colour must also possess a good degree of stability at a cut surface.

In consequence of these conditions the cold smoking process differs from the processes already described, and the following stages may be distinguished: Development of colour in the meat, drying of the meat (hardening); drying of the skin; smoking.

In addition to the processes going on during smoking, which have already been described, the treatment for the dried sausages includes a further stage—the meat-drying process.

The Meat-Drying Process

The hardening effect of the drying period may be explained in the following manner: As already mentioned in the first part of this article, the hygroscopic character of the salts added to the meat causes the accumulation of meat juice between the tissues, or, putting it the reverse way, the tissues are surrounded by a layer of protein solution.

During the drying process the skin has to act as a

* *Continued from August issue.*

diaphragm, through which the moisture of the filling material can diffuse. Therefore this process must not be unduly hurried, and the escape of humidity from the skin into the open air must be balanced by the supply of the skin with water from inside the filling. Otherwise, if the skin is first dried, it will become parchment-like—*i.e.*, the cells of the skin will dry up and no diffusion of humidity from inside the sausage through the skin into the open air can take place, and

FIG. 3.—Salami Sausages in the Processing Room.

the product remains moist and soft. Should drying once occur, the diaphragm structure must be regenerated if possible. This restoration can sometimes be effected by the use of moistened air, but it must be done very carefully.

The drying process consequently proceeds from the inside to the outside, at the same time reducing the amount of water still remaining in the tissues. This must be continued until the centre of the sausage has been dried. The solution of proteins thereby becomes concentrated and the tissues are then surrounded by a rather dry protein substance which has a certain stiffness. Besides the hard appearance of the sausage, the presence of this protein substance may be detected by a certain sticky feeling on the tongue when tasting these brands.

It will now easily be understood what will be the bad influence of greasiness arising during the hashing process. The fact may be remembered that the emulsion of proteins curdles above a temperature of about 113° F. (45° C.), thus forming a coagulant which does not deliver up the water at the low degree of temperature applied, if at all. The tissues are then surrounded by a layer of coagulant which acts like a lubrication between the particles, thus keeping the sausage soft.

The cold smoking treatment for these brands is therefore best carried out in a room specially designed for this purpose. It is advantageously equipped with a complete plant for air conditioning, an appropriate air distributing system, and instruments for the supervision of temperature and moisture. Uniform output and avoidance of waste can only be obtained in that way, which, of course, requires a somewhat more expensive installation, but which makes the process independent of the general weather.

It is advisable to divide this room into several independent compartments, thus preventing sausages which have already been partly treated from coming in contact with freshly made and wet bulks.

The Sweating Process

As already mentioned, the drying process must not be forced by the application of air with too low a moisture content or by too rapid a supply of air, both methods imparting a parchment-like consistency to the skin. In order to shorten the drying process, a relatively new preliminary treatment has been developed and has proved satisfactory; it is carried out before the actual drying process begins.

This treatment is best performed in separate chambers, known as sweating chambers, which are heated by hot air and direct steam, and which are also equipped with instruments for controlling temperature and humidity.

The sausages remain for one to two hours in these sweating chambers, the outlet being closed for the first part of the treatment; as a consequence, the atmosphere of the chamber develops about 100 per cent. humidity at this stage. A very efficient loss of moisture will occur, and is detected in the form of drops. This is described as the "sweating" of the sausages.

Simultaneously the colouring process starts, and after a short drying period the sausages are ready to leave their "Turkish bath" in order to be placed in a special

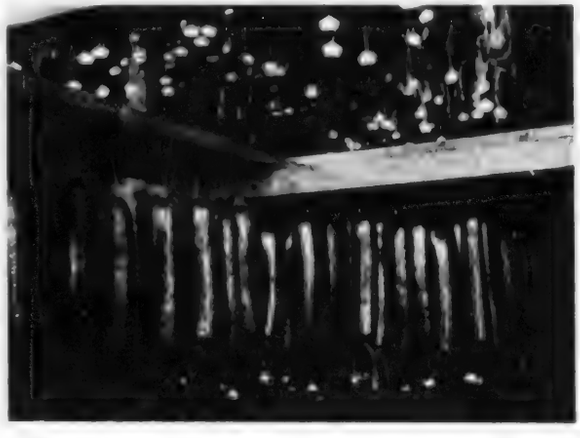

FIG. 4.—Salami Sausages at a later stage than in Fig. 3.

FIG. 5.—The Manufacture of Scaldings.

room where the drying process is continued. The sweating process could of course also be carried out in this room, which should be equipped for this purpose also. However, the drops formed as a result of sweating always contain a certain amount of meat juice, and this soon starts to go bad. Therefore the room must always be cleaned out thoroughly after the sweating process has finished. This may be rather difficult in a full chamber, as the sausages must be prevented from becoming re-moistened. In spite of all precautions, a permanent smell will become attached to the room in the course of time. For this reason it is always better to have a separate sweating chamber.

After this the sausages receive the smoking treatment. Special care has to be taken here in order to avoid re-moistening the product, which would in this case make the skin greasy.

(*To be concluded.*)

FRUIT STORAGE METHODS

LENGTHY refrigerated storage of fruit in bulk is frequently uneconomical; consequently attention has been directed towards other and less costly methods.

Gas storage has been developed in this country and is now employed commercially for apples. A news paragraph on this subject appeared in the June issue of FOOD MANUFACTURE (p. 221). In the U.S.A. investigations have recently been made regarding the air-conditioned storage of oranges and other citrus fruits. A. E. Nelson and R. D. Nedvidek describe their work on this subject in the May, 1934, issue of the *California Citrograph*.

A special building was erected for the investigation, which was carried out on a commercial scale. The building contained two rooms each 20 by 40 feet. Fresh air of 95 to 98 per cent. humidity was supplied at 350 cubic feet a minute. Navel oranges held at 50° F. showed 1·09 per cent. decay and fruit at 65° F. showed 2·18 per cent. decay after four weeks' storage.

The results of the preliminary investigation, while not conclusive, indicate that with proper air-conditioning facilities, the flavour, grade, and keeping qualities of Navels from Central California can be greatly improved.

It is also reported that a prominent Californian citrus grower intends to place his entire crop of grapefruit in air-conditioned storage this year.

There seems to be no reason why other fruits should not be stored successfully when provided with suitable conditions of temperature, humidity, and air movement.

G. R. B.

Carting Wheat by Bullock Team in Australia.

WHEATEN FLOUR
and its more important
CONSTITUENTS

By C. W. HERD,
Ph.D., B.Sc., F.I.C.

Part II.* Protein—Starch

In the 1933 Jubilee Lecture of the Society of Chemical Industry, Lampitt censured food chemists on the lack of true fundamental research work. However justified he may have been, the above piece of research by Bungenberg de Jong and Klaar would surely be sanctioned as having placed our knowledge of flour proteins on a higher scientific plane. The work is far from finished and much more has to be done before the properties of dough formation and dough qualities can be fully explained. Thus there is the question of electrolytes (*e.g.*, NaCl) in the dough and again what effects on the complex has the addition of minute traces of chemicals, such as ammonium persulphate and potassium bromate, or the subjection of the flour to heat treatment; these are known commercially to alter the baking behaviour of the dough, and as yet no completely satisfactory explanation of these effects has been forthcoming. The Dutch workers are continuing their investigations and the cereal world awaits with interest the further advances which are definitely expected from this most fruitful beginning.

Strength

So far in this article an effort has been made to avoid the use of the terms "strong" and "weak"; these are technical terms used freely in the trade and have been variously defined from commercial practice. Thus the standard definition of a strong wheat is that given by the Home Grown Wheat Committee of the National Association of British Millers—namely, that a strong wheat is one which yields flour capable of making large well-piled loaves. The work of Kent-Jones modified this by eliminating the gas-production factor, and he has also pointed out that the production of a large well-piled loaf will depend on the baking system used. Some flours suit one system and some give better results with another system. The present writer prefers to call this ability or otherwise of a flour to give a good loaf of bread the "baking quality" of the flour and includes in this term the gas-production factor, because this latter is undoubtedly an important one in the commercial value of a flour. Further, the system to be used in the baking must be considered. Thus a flour will have a good baking quality on a short system if it will produce a large loaf on fermentation systems of, say, 4 to 6 hours; such a flour would not necessarily have good baking quality on longer systems. The term "strength" could be reserved for that condition of the gluten complex which imparts to the flour the ability to absorb a large amount of water and to give a tough and resilient dough and the ability to carry the admixture of other flours with the minimum of loss to the toughness and resiliency of the dough. Thus a strong flour would be defined by its dough characteristics and not by the type of loaf produced.

Measurement of Dough Properties

Several attempts have been made to obtain a numerical measurement of the physical properties of doughs, but so far none of these has been adopted to any large extent, owing no doubt to the great difficulty of correlating such a physical measurement with the complicated and variable baking test. Apart from viscosity tests on flour suspensions, mechanical tests on dough have been developed in several directions, mainly in the use of small

* Continued from September issue.

thin pieces of dough, the stretching and extensibility of which have been measured. Among these may be mentioned that of Hankoczy, in which a thin piece of dough is stretched between two flanges by air pressure until the bubble so formed breaks. Further, Chopin of Paris has produced an apparatus which apparently works on a similar principle, but with a mechanical recording device, and some good reports of this have been received from America. Kent-Jones reports an apparatus designed by Reinders and van der Lee, which endeavours to correlate the consistency of a dough with the penetration into a standard cylinder of dough of a definitely weighted plunger. Most recent work, however, has favoured the use of a mixing apparatus and the measurement of the work involved in driving the mixer; various forms of wattmeter have been tried by Bailey and others, and very recently there has been placed on the market the Brabender farinograph, which claims to have made great advances in the accuracy of such measurements on this principle. A reliable mechanical tester of the physical properties of doughs would undoubtedly have a very useful place in cereal laboratories.

Starch

It has already been mentioned that the amount of work carried out on the starch component is only a fraction of that on the proteins, but it is none the less interesting. Quantitatively it is the main constituent of wheaten flour and does probably in some way enter the colloidal structure of dough, and it is only to be expected that differences will be found in its chemical composition or its physical constitution in flours of widely different character. Further, starch is the substrate of the saccharogenic enzymes and is the source of much of the sugar used by the yeast during fermentation. Starch, therefore, may play an important rôle both in the colloidal complex and in the gas-producing power of the flour or dough. Very little work has been done on the former of these two problems, but certain information is available on the chemical composition of the starch granule itself and also on its function in yeast fermentation. Further, some evidence has been obtained that this constituent is the one mostly concerned in the changes in bread during staleing.

In the first place starch was studied by the action of malt extract or malt diastase upon it, and it was discovered that starch was not homogeneous, but consisted of at least two fractions which differed in their resistance to attack by diastase. Various names have been suggested for these two fractions and somewhat different properties attributed to them by various workers, due to the activities of the diastase not being identical. It is more usual now to refer to them as α-amylose for the more resistant fraction and β-amylose for the less resistant portion. Further, the presence of certain hemicelluloses has been suggested in the starch granules, varying in degree of resistance to diastase attack. Maquenne gave the more resistant component the name of "amylopectin" and to the other the simple designation of "amylose"; he

An interesting photograph of a Threshing Machine, taken sixty years ago. It is probably unique, as it shows an engine utilising peat as fuel—note sods of peat lying near the engine, and the somewhat primitive-looking wheelbarrow used for carrying them to the machine.

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Harvesting Wheat in Queensland.

maintained that it was the amylopectin which conferred the property of forming a viscous paste. Much work has been directed to the separation of these two fractions or components. Ling, Nanji, and Harper suggested the use of barley diastase, which only hydrolyses the amylose to maltose, the amylopectin being converted into a β-hexa-amylose, and the so-called "hemicelluloses" being left in an insoluble condition. They pointed out that the ratio of amylose to amylopectin is constant in barley, wheat, and maize starches—namely, 2 : 1. This constant ratio for different starches, however, is not universally accepted. Potato starch is said to contain only amylose and amylopectin. Owing to the different responses to enzymic attack by the starch components, the great difficulties encountered in the accurate determination of starch in wheaten flour will be readily realised. Recently Taylor and Walton have isolated from wheat starch an α- and a β-amylose, which they state are not identical with those of Ling and Nanji, the ratio in this case being given as 24 : 76 of α : β-amylose.

The work of Samec is of fundamental importance on this subject; he has suggested that amylopectin is a starch phosphoric ester and that there is a relation between a high viscosity and the content of phosphoric acid in starch. He does not agree with Ling, for he found that amylopectin fractions from different starches varied in their relative percentages present in the starch. In addition to the phosphorus content he found differences in electrodialysis and in conductivity. Samec discovered, however, that wheat starch, which has a relatively high phosphate content, did not show corresponding values in the viscosity and electrochemical properties. He remarks: "This discrepancy could be explained on the assumption that potato starch and many other starches of a similar nature contain the phosphoric acid as amylophosphates just described, while, on the contrary, it is present in the cereal starches as a compound with proteins." A further extract from his work says: "Starch substances giving a blue iodine reaction are hydrated to a high degree, but in spite of this they are unstable in solution. They have a great association power, with naturally great adhesive and stiffening powers. The starch substances giving red iodine reaction show all these properties in a much less degree." As these substances have different molecular weights, varying from 2,000 to 200,000, it is concluded that these differences are caused by the constitution of the polysaccharide.

In addition to the constitutional differences, the size of the particles or micelles plays a rôle in determining the properties of starch solutions and pastes. Thus, quoting Samec once again: "If an amylose is free from phosphoric acid then its sols are the more opaque, and the less stable, the lower is the degree of dispersion of the starch in water. A jelly formed from an amylopectin fraction has the greater consistency, larger molecular aggregates, greater molecular cohesion, and a stronger electrical charge caused by ionogenic groups, the greater is its non-ionic hydration." This recalls the work of Armstrong, who showed that flour consisted of starch granules of three different sizes. The smallest, which constituted the majority, were from 3μ to 4μ in diameter, and the largest about 30μ to 35μ, with an intermediate zone. The proportion of large to small granules might vary from flour to flour, and naturally these granules may show diverse resistance to enzymic attack. Further, when a large granule has been broken open, a larger amount of starch becomes available to the enzyme than when a small granule is ruptured. Mangels came to the conclusion that some wheaten flour starches are more resistant to enzymic attack than others, and in fact he was of the opinion that the different diastatic activities observed were solely due to these varying powers of resistance of the starch. Possibly both factors of actual diastatic activity and starch resistance may play a part in determining the property of the flour.

X-Ray Investigations

Formerly starch was regarded as an amorphous substance and of high molecular weight, but the recent application of X-ray spectrography has shown that it is of a crystalline nature. The spectrum given by starch is of a weak nature, so that it is difficult to get exact measurements of the space lattice, and naturally it is not as yet possible to draw conclusions as definitely as might be wished. Katz has noted that the greatest similarity

exists between the various natural kinds of starch, although it is not possible to state that they are absolutely identical. The same worker concludes "the elementary cell of starch contains space for but one or a very few glucose radicles. The exact number cannot be given with certainty as yet—maybe it is only one; nevertheless, it can be definitely stated that the number is very small (one, two, or four, for instance). This result is in direct contradiction to the conception entertained during the last decades—viz., that starch must have a very high molecular weight amounting to several tens of thousands. Such a molecule would correspond to a far larger elementary cell." Much work remains to be done to establish these ideas on a quantitative basis, but this fundamental work is of extreme importance and fascination. In a recent publication Katz has shown that the X-ray diagram of starch remains unchanged when the substance swells or contracts, as far as nearly reversible swelling is concerned. "The meaning is probably that the water is absorbed not in, but only between, the separate, submicroscopical crystals." Changes have been observed, however, when the starch is thoroughly dried, the diagram becoming indefinite; this change has been found with potato starch, but not so far with wheat starch. On gelatinisation of wheat starch (starch + 37 or 45 per cent. water and then heated to 100° C.), the normal spectrum disappeared and a new spectrum was formed. This new spectrogram seems to indicate a material of a less crystalline nature. Katz says: "The best explanation of the changes in the X-ray spectrum during gelatinisation seems to be that a chemical change takes place (perhaps the binding of water), or we could possibly assume that crystalline starches become amorphous." The so-called process of retrogradation (*i.e.*, the change taking place on the ageing of gelatinised starch) is accompanied by an interesting change in the X-ray spectrogram: "The interferences of the non-gelatinised starch come back; those of the gelatinised starch remain visible." In spite of this fundamental work the exact structure of the starch constituent in flour cannot be given, neither can its rôle in dough structure or in fermentation be adequately explained. This is a very promising field for further research, as it is probable that differences in flours may in some measure be related to differences in starch structure or constitution.

Another point which is frequently overlooked is the avidity of starch for water, and it has been emphasised by Alsberg that the water absorption of a dough must be divided betwen the gluten and the starch, the latter playing possibly a not unimportant rôle in this respect. Alsberg pens a picture as follows: "In a hard wheat flour the gluten is present in relatively large masses in which the greater part of the starch is embedded. The number of starch granules that are to be seen lying free is relatively small. In soft wheat flour the gluten masses are smaller and carry in them correspondingly less starch. A relatively large proportion of the granules lie free. Hence in a strong flour the water must diffuse through a layer of gluten before it can reach the majority of the starch grains, while in a weak flour it can reach most of them directly. It is therefore quite possible that, in a dough made from a strong flour by the ordinary process of kneading, the starch granules never become fully saturated with water or else become so only gradually as fermentation proceeds, whereas in weak flour doughs the starch granules become fully saturated almost immediately. Possibly one of the effects of the high speed mixers (used in America) is to hasten the saturation of the starch granules and thus to contribute to the better absorption effected by these machines."

Staleing

The other important aspect of starch in bread making is its influence on the staleing of bread. The work of Katz is again pre-eminent in this field; he conceives the changes of starch on baking as a first form of gelatinisation and that during staleing a retrogradation of the starch takes place. This process of gelatinisation is considered as a chemical process, involving a physico-chemical equilibrium, which is governed by the law of mass action, and he obtains confirmation from his work on the X-ray spectra. A physico-chemical equilibrium is believed to exist between fresh and stale bread, the two forms exhibiting the same behaviour as allotropic forms of the same substance. It is argued that the rate at which staleness sets in, like the rate at which physico-chemical equilibria in general become established, is dependent upon temperature. Alsberg points out, however, that staleness is reversible through heat, whereas starch re-

(*Continued on page* 355.)

Wheat Silos at White's Bay, Sydney, N.S.W.

Pressure in Cans

By
P. Chambellan
H. Cheftel
M. L. Thuillot
R. Boudeau

Part IV*—Experimental and Technical Data

THE DRIVING out of air by heating, before finally sealing the can, has always been practised in the canning industry. Appert followed similar methods for bottled preserves many years ago, and even before the discoveries of Pasteur there was a theory which ascribed the preservation to the partial vacuum obtained through the heating.

The old method of driving out the air consisted in heating the cans, already filled and sealed, to a temperature of 100° C. Then a small hole was bored in the upper end, the bottom was pressed back to its original shape, and the aperture was again sealed with a drop of solder. With increase of output this method of procedure, requiring much hand labour, became cumbersome. But whereas in the United States the adoption of modern exhaust machinery has perfected this method, in Europe it has been abandoned except when canning products demanding absolutely complete absence of air.

In latter years, however, the importance of the exhausting process has been more and more clearly recognised, and English, German, and even French manufacturers make exhaustion apparatus similar to that employed beyond the Atlantic.

The relation between exhaust, partial vacuum, and hydrogen swells was expounded by Bigelow in 1914 (W. D. Bigelow: Swells and Springers—*Research Laboratory, National Canners' Association*, Bulletin No. 2, 16 pp., 1914). Later, Bitting (A. W. Bitting: Methods followed in the Commercial Canning of Foods—*U.S. Dept. Agric. Bull.* No. 196, 79 pp., 3 plates, 1915) reporting a series of technical experiments pursued in 1912-13, emphasised the importance of exhaustion and observed that the absence of air decreases dissolution of tin. The degree of vacuum inside the cans, measured at the surrounding temperature, varies according to the temperature at which the can has been sealed; the average figures given by Bitting are shown in the table at the head of the next column.

Bitting likewise observes that the vacuum gradually decreases in those cans the contents of which corrode the metal and liberate hydrogen, and he gives temperatures and exhaustion periods for various canned foods.

Later, this same author (A. W. Bitting: Exhaust and Vacuum—*Research Laboratory, National Canners' Association*, Bulletin No. 8, 58 pp. (illustrated), 1916) studied the question of exhaustion and vacuum in greater detail, giving some of the reasons in favour of the adoption of this method and examining the influence of the initial temperature and of the free space.

RELATION BETWEEN TEMPERATURE OF CAN AT THE MOMENT OF SEALING AND INNER TEMPERATURE, AFTER PROCESSING AND COOLING (SOLDERED CANS).

Temperature of Sealing.	*Vacuum in mm. of Mercury*
93·3°	419
87·8°	390
82·2°	330
76·7°	250
71·1°	216
65·6°	203
60·0°	178
54·4°	127
21·1°	25

In 1917, Bitting and Bitting (A. W. Bitting and K. G. Bitting: Bacteriological Examination of Canned Foods—*Research Laboratory, National Canners' Association*, Bulletin No. 14, 45 pp., 2 plates, 1917) published new studies on these questions and, among other things, observed that the pressure increases when the free space diminishes.

In 1922, Magoon and Culpepper (C. A. Magoon and C. W. Culpepper: Relation of Initial Temperature to Pressure, Vacuum, and Temperature Changes in the Container during Canning Operations—*U.S. Dept. Agric. Bull.*, No. 1022, 51 pp., 37 figs., 1922) published a very extensive experimental study, in which they described in detail a device used by them. The can, fastened to the cover of the autoclave, is upheld inside this latter with the aid of a contrivance they had already made use of in their measurements on heat penetration (C. A. Magoon and C. W. Culpepper: A Study of the Factors affecting Temperature Changes in the Container during the Canning of Fruits and Vegetables—*U.S. Dept. Agric. Bull.*, No. 956, 55 pp., 57 figs., 1921). The inside of the can communicates with a mercury manometer having two branches connected with one another by a flexible tube; one of these branches is movable.

Recently, Munro (R. J. Munro: The Pressures De-

* Continued from August issue.

veloped in Cans during Processing—*Food Technology*, 1931, **1**, 57-60, 6 figs.) has very rightly criticised this measuring device and has used a contrivance which is not nearly so simple, but enables some of the sources of error to be eliminated. Our own experiments enable us entirely to confirm Munro's criticism of the methods of measurement; however, it must be stated that there exist numerous other sources of error, foremost of all the differences between individual cans, differences to which Magoon and Culpepper had already directed attention. Moreover, the measurement of the temperature especially requires to be carried out with great care, as in the vicinity of 115° C. a difference of only one degree involves a variation of pressure of the extent of 50 gm.

For our experiments, intended above all to check the validity of the theoretical considerations, we adopted an accurate metallic manometer, having a dial 12 cm. in diameter and easy to manipulate.

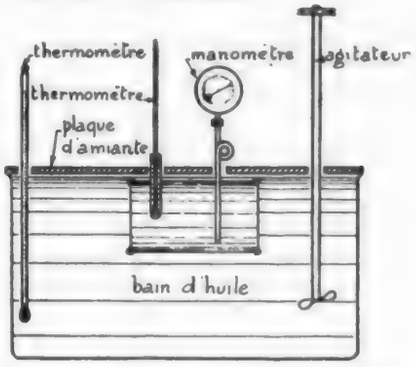


FIG. 5.—Arrangement of Apparatus for the Study of the Inner Pressure.

The can, connected to the manometer by means of a metal tube, was submerged in an oil bath (see Fig. 5). The tube as well as the spiral of the manometer were filled with water, the tube reaching down almost to the bottom of the can. This arrangement was found to be necessary even for measurements of very little precision. The truth is, that when the manometer is in communication with an atmosphere of vapour and the pressure therefore is not transmitted by the medium of a liquid, the difference of temperature between the can and the manometer is the cause of quite a considerable error. We had ascertained this fact experimentally in the following way: in a first experiment we immersed the can in the oil bath, but left the manometer out of the oil, while in a second experiment we completely immersed both can and manometer. The difference between the two readings in these two cases was of the order of 250 gm. Moreover, when the manometer is not immersed in the oil, the cooling effect produced by the slightest draught of air is sufficient to depress the manometer needle the equivalent of many grams. This phenomenon is accounted for by the principle of Watt.

It would, however, be very difficult to take readings on an entirely immersed manometer; moreover, another error would then enter by reason of the fact that this instrument is built and calibrated for work at normal atmospheric temperature. That is why we preferred to actuate the manometer through the intermediary of water.

These findings lead one to question the accuracy of temperature measurements made merely with the help of a manometer placed at a distance of several metres from the autoclave, as is still the practice in certain factories.

Our manometer, used as we have just explained, was checked before and after each experiment by comparison with a mercury manometer. The readings were likewise corrected according to the atmospheric pressure and to the surrounding temperature. The can was entirely immersed in an oil bath and this latter was covered with an asbestos sheet.

At first the thermometer was set in with the help of a stuffing box, but later on we adopted a more simple arrangement; this consisted of a tinplate sheath soldered to the can and filled with a liquid having a high boiling temperature. The thermometer was placed freely in this sheath and could very easily be changed during the experiment. This arrangement is of course unsuitable if it is required to study the temperature at the *centre* of the can; but in our experiments, in order to obtain a uniform temperature, we had been careful to take readings only after the desired temperature had remained constant for at least an hour and after the readings both of the thermometer dipping in the oil and of that placed in the can agreed exactly. It is just because a slight difference of temperature has a very large influence on the pressure (about 50 gm. for each degree Centrigrade) that it is particularly important to pay attention to this factor. The thermometer readings were of course corrected by comparison with a standard thermometer.

COMPARISON OF EXPERIMENTAL RESULTS WITH THEORETICAL FIGURES.

Can No.	t_f degrees C.	P_f read gm.	P_f calculated. gm.	difference.
1 ..	82	575	635	−60
	102·5	1,300	1,285	+15
	114	1,830	1,830	0
2 ..	102·5	1,285	1,285	0
	114	1,815	1,830	−15
3 ..	102·5	1,230	1,285	−55
	112	1,695	1,725	−30
4 ..	84	650	695	−45
	102·5	1,285	1,285	0
	114	1,790	1,830	−40
5 ..	102·5	1,275	1,285	−10
	114	1,780	1,830	−50

The above table gives the comparison between theory and the figures obtained in a series of experiments. The following diagram (Fig. 6) represents the theoretical curve calculated for the experimental conditions of the same series of tests. As may be seen, the calculated and the experimental figures agree in a most satisfactory manner, the more so as our temperature measurements were made with an approximation of about one-half of 1° C.

Magoon and Culpepper likewise describe an extremely simple device for measuring the resistance of the cans to concussion; this is an important point, for there is a certain internal pressure below which it is not advisable to go if collapse of the cans during transport is to be

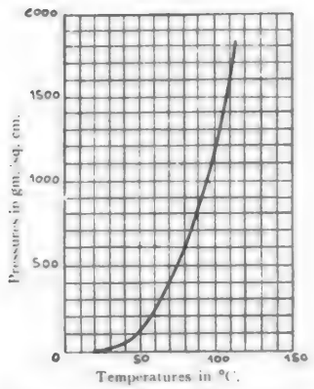


FIG. 6.—Theoretical Curve $P_{fr}=f(t_f)$, Can L6.
$t_i = 20°$, $v_i = 750$ c.c., $E = 0{\cdot}5$, $P_c = P_a = 1{\cdot}033$ kgm.

avoided. This device is represented in Fig. 7. A can is used as the striking body, and is suspended above the can to be tested, on which latter it is allowed to fall; by pouring molten lead into it, this suspended impact-can may be brought up to the normal weight of an equal sized can filled with the food studied.

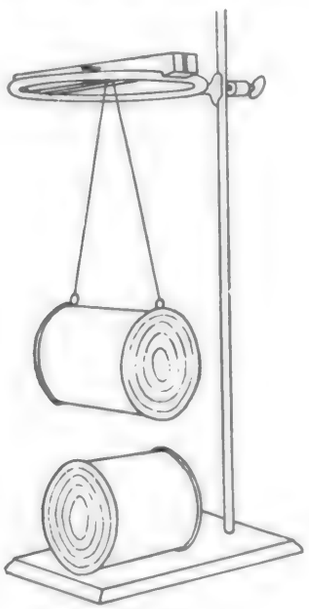


FIG. 7.
After Magoon and Culpepper.

The testing of the can may be varied by changing the height of fall. By measuring this latter we easily get an idea of the resistance which the can offers to ordinary handling in practice.

The authors we have just mentioned observe a lack of concordance between the theoretical pressures and the pressures determined by them experimentally, but it must be pointed out that their theoretically calculated figures were based merely on the pressure of water vapour. Magoon and Culpepper have, however, analysed the factors which they do not take into account in their theoretical calculations, and have examined the influence those factors might exercise. It is interesting to note that, through their experimental study of the effect of the free space in the cans, they arrive at a conclusion opposed to that of Bitting.

Our calculations, and the comparison we have made between the L6 and the L7 cans (page 211), show that the influence of the free space is to be considered as being a characteristic feature of the can itself, which perhaps explains the differences between some of the results obtained by the authors mentioned. In any case, for the American cans No. 2 and No. 3 with the ends actually used, it is the conclusion of Magoon and Culpepper which seems to us to agree with our calculations: the pressure diminishes when the free space decreases.

The majority of the experiments of these two authors were devoted to the study of the various canned foods. They have investigated the variation of the inside pressure for different initial temperatures and sterilising temperatures, and have obtained some very interesting results. With distilled water the pressure curve as a function of the time rapidly reaches a maximum value, and then remains horizontal (see Fig. 8).

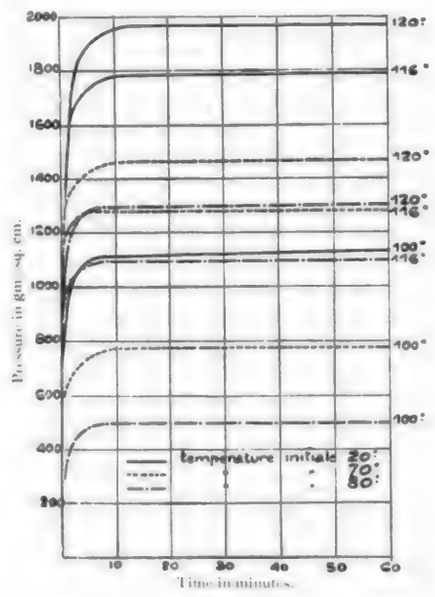


FIG. 8.—Distilled Water in No. 2 Cans.
Experimental Time-Pressure Curve (after Magoon and Culpepper).

This shows that the pressure increases during the first ten minutes—*i.e.*, the time during which the can is taking in heat—and that after that a state of equilibrium is reached in every case. But in practice this is not the case; equilibrium, if it is reached at all, is attained only for sterilising temperatures not exceeding 100° C. Generally the curve continues to rise, which proves that a continuous liberation of gases is going on. Magoon and Culpepper advance the hypothesis of a decomposition of the food brought about by heating; there is no doubt about the truth of this, as has already been proved by other experimenters, but we think that it is also necessary to consider the sluggishness with which the gases simply held mechanically in the food usually escape. In our opinion this escape of gas had not yet finished when the

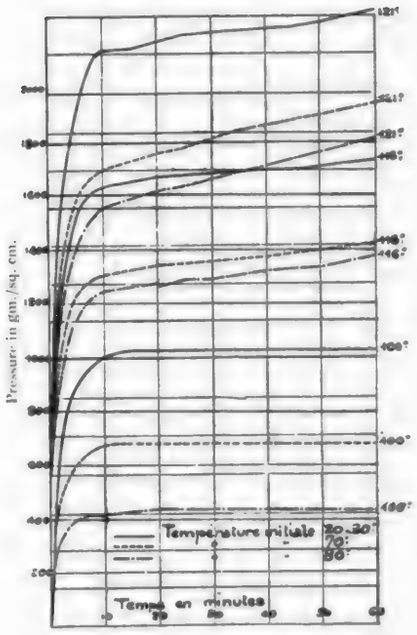


FIG. 9.—Beans in No. 2 Cans.
Experimental Time-Pressure Curves (after Magoon and Culpepper).

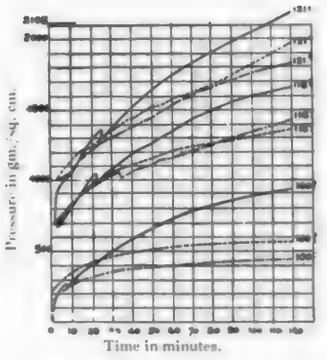


FIG. 10.—Sweet Potatoes in No. 3 Cans.
Initial Temperatures 25° C., 70° C., and 80° C. Time-Pressure Curves (after Magoon and Culpepper).

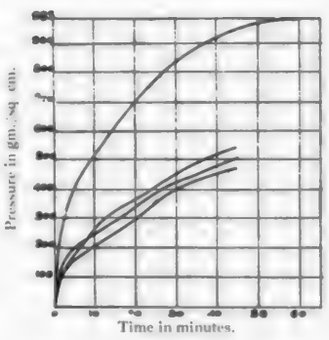


FIG. 11.—Tomatoes in No. 3 Cans.
Time-Pressure Curves for different periods of exhaust at 100° C. Processing at 100° C. (after Magoon and Culpepper).

various experiments were stopped. But whatever the origin of these gases may be, the practical result remains the same.

We reproduce the curves plotted by Magoon and Culpepper for beans (Fig. 9), sweet potatoes (Fig. 10), and tomatoes (Fig. 11).

The comparison of these curves with the distilled water curves clearly shows the influence of the slow escape of gases; the importance of the closing temperature is also seen. In the case of the tomatoes, the filling was carried out whilst the product was cold, and it was the duration of the exhaustion process which was made to vary; we see that the largest decrease of pressure takes place during the first two minutes of exhaust. Since during so short an interval the temperature of the material itself cannot have increased very much, it is clear that it is the temperature of the free space which is the main factor governing the internal pressure. But it must not be forgotten that the value of a very short period of exhaust is lost unless care be taken to seal the cans immediately after the exhaustion is finished. Morris also insists on this fact (T. W. Morris, "The Exhaust in Canning", FOOD MANUFACTURE, 1931, **6**, 288-90).

(To be concluded.)

WHEATEN FLOUR (Continued from page 351.)

trogradation is not, and further that this retrogradation proceeds very slowly at higher concentrations, and of course in bread the concentration is high, but the going stale of bread may be rapid. The chief methods for the measurement of bread staleing have been (i) the compressibility of the crumb, (ii) the change in the swelling power of the crumb, the swelling power in water decreasing during staleing, and (iii) the change in quantity of soluble amylose, which is larger for fresh bread than for stale. These last two methods have been traced to changes in the starch constituent of the bread.

Staleing of bread can be partially inhibited in a number of different ways, although none of these has yet been proved to be suitable for commercial practice. Maintaining the bread at 60° C. kept it in a fairly fresh condition, as did also a temperature of $-185°$ C. Katz found that the staleing effect had a maximum rate of about $-2°$ to $-3°$ C. At a temperature of $-8°$ C. a fairly strong inhibition of staleing was evident. Certain chemical substances have also been found to inhibit the staleing, but in no case were they of a nature suitable for commercial use.

(To be continued.)

GOLF AT LEICESTER

Will you be playing?

ARRANGEMENTS are now completed for a golf meeting on Sunday, November 4, at a first-class course at Leicester. This is, of course, during the run of the Canners' Exhibition in the town, and every care is being taken to ensure a thoroughly enjoyable time for all.

We have received numerous enquiries and applications, but we still have room for more. We would remind all those interested, however, that the time is getting rather short.

The "Can-Cans" organisation will show themselves in public and will compete for a trophy of their own; this will be in addition to the other events.

Whether you are scratch, or whether you need a ledger to keep your handicap accounts, you will be welcome. Please send in your name to Golf Secretary, FOOD MANUFACTURE, 231, Strand, London, W.C. 2.

You will receive an entry form and times and other particulars later. Those who cannot bring partners will be paired with men of similar handicap.

"The Breadwinner."

CONFECTIONERS'

THE CONFECTIONERS' and Bakers' Exhibitions, held in London during the first and second weeks in September respectively, are now behind us, so to speak. Those who were fortunate enough to be able to wander round the comprehensive displays of machinery, raw materials, and finished products, assimilating fragments of valuable knowledge and lots of new ideas, meeting old friends, and having a good time generally, will now be enjoying that feeling of "goodness" such as one experiences during the first few days of a new suit. To attend these exhibitions has almost become a matter of replenishing one's intellectual wardrobe for the ensuing twelve months, and the expense and sore feet incurred are well worth the while. In fact, one might truly say that these annual visits have now become an absolute necessity to the rational advancement of one's business.

It is not our object to set down in detail here all that these exhibitions had to offer the intelligent visitor, but merely to record the few outstanding impressions that limitations of space permit.

The Confectionery Exhibition

First a few general remarks about the arrangements at the Confectionery Exhibition.

The ground floor stands were of particular interest to the actual manufacturer, as they contained examples of machinery and materials used in the factory. But the arrangement on this floor was such that many of the smaller stands could be overlooked even by interested visitors. The idea of surrounding the green "sward" with large and imposing stands may be effective from one point of view, but it is doubtful whether such a scheme allows the smaller stand to obtain its fair share of publicity. Perhaps those small stands, tucked away, as it were, in corners, pay much less proportionately for the space occupied.

The upper floors this year had a much more friendly appearance. The magnificence of the displays was even better than those of previous years, but they were rendered much more attractive by the yellowish tint in the general lighting system. It is impossible to mention individual exhibits, as the general standard was high. "Satisfactory business" was generally expressed at the end of the Exhibition, though some people appeared to doubt the wisdom of holding such a lavish display every year.

A new pineapple flavour of entirely synthetic origin was an interesting product of one essence firm. A remarkably characteristic taste was noted in the high-boiled sweets sampled. Another firm showed for the first time a coffee flavour in powder form containing all the soluble extractives of the bean.

Marshmallow at the Bakers' Exhibition

Marshmallow is an old friend of the confectioner, and its importance in the bakery trade was emphasised by the prominence given to it by so many of the exhibitors. It is curious that some of the representatives with whom we chatted at the Bakers' Exhibition referred to their product as being equal to a well-known American brand, which appears to indicate that U.S.A. has set the standard in this particular respect.

Actually, bakers' marshmallow has to stand up to conditions different from those appertaining to sugar confectionery work, necessitating certain modifications in recipes and processes in order to incorporate the required degree of stability. Altogether, marshmallow manufacture is a complicated affair calling for extreme care, whatever the purpose for which it is required.

Marshmallow falls into the group of whipped confections, consisting essentially of a sugar foam. The vital factor is the stabiliser or mixture of stabilisers used, such as gelatine, albumen, agar-agar, gum, and starch. The matter is a complex one requiring careful attention to such points as the amount of water taken up, the optimum temperature, the degree of beating necessary.

Bakers' Fillings

Creams and fillings, generally, open up the prospect of introducing variety in an attractive form, and the Bakers' Exhibition demonstrated the wide range of materials that are available for this purpose. Some good

AND BAKERS' EXHIBITIONS

examples of fillings made from reconstituted creams were shown and also others which employed hen albumen as a basis. Incidentally, dried hen albumen in both clear lump and powdered forms was much in evidence. Among what may be considered variations of fillings we noticed praline creams and foams, marzipan paste, macaroon paste, meringue paste, royal icing paste, almond icing,

A very topical exhibit!

and many other similar products. Incidentally, a point which occurred to us was the care required to ensure that these fillings be used in fresh condition. This opens up the possibility of devising some means of considerably extending the life of these materials.

Bakers' Chocolate

Apparently, bakers find it difficult to use chocolate in its usual form of couverture. No doubt dipping temperatures and other practical points of manipulation present difficulties; for instance, many bakery shapes would require some ingenuity in order to obtain a satisfactory and permanent gloss. Accordingly, chocolate "compounds" for incorporation with the covering material have enjoyed a considerable measure of success. Now we find that a further step has been taken in presenting chocolate materials in paste form ready for use, and they appeared to maintain quite a good gloss throughout the period of the Exhibition.

Other Materials

There is nothing to be gained and, from our viewpoint, a great deal of space to be lost, by cataloguing the multitude of products which constitute the raw materials of the baker. Flour, sugar, eggs in their various forms, piping jelly, fruits, and so on—almost *ad infinitum*. Compound fats and lards were particularly obtrusive and left no doubt in one's mind as to the possibility of obtaining fats of almost every conceivable melting point, setting point, and texture.

Improvers, too, were well in evidence, which may be interpreted as indicating an enhanced interest in the ways and means of bettering the quality of bread. That this thought was not altogether an irresponsible one was made clear in the course of an interesting conversation we had with Mr. F. E. Thomas, M.A., who is an authority on these matters. But his range of knowledge extends beyond this particular field, as is evidenced by his contributions to the controversy on "Milk in Bread" which has been running now for several months in this journal in spite of efforts on our part to stem the tide.

The Competitions

Another culprit in this Milk in Bread affair is, of course, Mr. E. B. Bennion, the well-known principal of the baking department of the Borough Polytechnic, London. Mr. Bennion was literally here, there, and everywhere, particularly as he was one of the "big men" in the competitions. We gathered from him that this year the Starkey Cup Competitions mustered some sixteen entries, the greatest number ever yet shown. All were good commercial exhibits and they showed a clean finish. In the

The imposing façade of Olympia.

wedding cake classes one was struck by the uniformity of good finish, but in the use of colours many competitors had much to learn. On the other hand, the birthday cakes betrayed a lack of originality, and, as far as decorated cakes are concerned, this year's entries might aptly be summarised as "scroll-less", for there was hardly a cake exhibited which was embellished with a conventional scroll. In the division of confectionery the general level was good, but there were few outstanding exhibits. It was not difficult to detect, however, a weakness in the marzipan fruits and roses. Finally, one cannot conclude this brief review without paying a tribute to that masterpiece of modelling—"The Breadwinner"—executed by the artistic hand of Mr. W. T. Lanes.

A Wedding Cake fit for a Princess!

Baking Plant

At both exhibitions one instinctively turned towards the moving machinery before settling down to detailed examination of the smaller fry in the shape of bottles, boxes, packages, and so on. The question as to what is new bulks large in one's mind, although in all reason one has really no right to expect that in the short space of twelve months the professors of engineering will have turned the confectionery world upside down with sensational inventions. Nevertheless, there was something to show in the way of new departures from conventional design, and a brief reference to some of them may not be out of place.

For the first time was shown a two-sack removable pan type dough kneading machine fitted with what might be termed a semi-cover during kneading and a complete cover subsequent to it, thus converting it into a self-contained prover. We noticed, also, improvements in the Roll and Bun Divider-Moulder and in the Single-Cylinder Dough Divider linked to a Spindle Hander-Moulder. There was also the electrically heated two-deck oven with the chambers under separate control. As a matter of fact, the application of electric power becomes increasingly obvious as the exhibitions come and go. Everything from the smallest whisk to the formidable-looking kneaders and ovens is being electrified, and along with this one finds ingenious efforts in the provision of devices for controlling temperature. Apart from everything else, one welcomes this change from the hygienic point of view.

How long it will be before the bakery or confectionery becomes more or less completely mechanised under automatic control is a question one might profitably put to Mr. H. G. Wells. That we are tending in that direction there is little doubt, and support to this thought was given by the appearance at the Exhibition of a "Robot" Kneader contrived so that the baker can put in his flour and other materials in the evening, set the clock to 5 a.m., and sleep peacefully until the alarm announces that the dough is ready for the oven.

Dough kneaders and cake mixers were everywhere in endless variety, and there were brakes, moulders, and dividers also, but it is for the future to provide a linking up of these units to give a continuous and fully automatic layout.

In our wanderings in and out of the stands we ran into Mr. Frank Gardner (which is really not surprising when one comes to think of it), and he led us gently away to see his new small-size combined dresser-sprayer-mixer upon which he has been hard at work for some time past. It is really a beautiful little machine and must have called for considerable ingenuity in its design. The screen is easily changed for different coloured products. While inspecting this we noticed another interesting novelty in the shape of a ball mill carrying on its axis a small test mill, thereby greatly facilitating control of the operation of grinding.

The Royal Agricultural Hall, Islington.

Confectionery Machinery

The Confectionery Exhibition was, as one would expect, more varied in respect of types of equipment. There is not space here to do more than

mention one or two of the outstanding examples. A new continuous sugar cooker which is claimed to yield improved hard-boiled goods and satin and plastic work attracted considerable attention. Other machines which showed improvement were those employed for wrapping. Several stands exhibited models for different purposes, and the speed of wrapping now attained makes the use of such plant an economic necessity. Wrapping and foiling irregular shapes, once a hand operation, is now effectually dealt with by machines which are capable of handling up to 100 pieces a minute.

Lemonade cubes and similar tablets have become extremely popular during the last year. These can be packed by machine into cartons or, more cheaply and equally well, wrapped in waxed paper and surrounded by a band giving the name of the maker of the contents.

Among the chocolate making machines, refiners, enrobers, and depositing machines were well represented. A single refining will now yield degrees of fineness which only a few years ago were unattainable except by passing through the rollers several times.

Cubed vegetables are of interest to certain manufacturers, and the latest dicing machine produces these in a uniform manner. Almond splitting at the rate of 300 lb. per hour was shown to be possible on another of the exhibits, and the nut need not be semi-dried before the operation. An apple peeler and corer dealing with thirty-two apples per minute offers considerable reduction in labour costs.

An oil burner made its appearance at the previous exhibition, and this year exhibits were much improved over the original types. In many cases gas is expensive and liable to great pressure fluctuations. Heavy grade oil can replace the gas with a saving of some 25 per cent. of fuel costs and give at least a 10 per cent. quicker boil.

The self-contained unit no doubt has appealed to many who saw it. This self-generating steam pan offers distinct possibilities to new small firms, and the fittings include an electric pilot light for igniting the oil flame. The "blanket heat" given by oil reduces danger of scorching, which is of great value in many cases.

TONIC FOODS

WRITING on the subject of tonics in the August issue of *Manufacturing Chemist*, Mr. F. G. Hobart, Ph.C., Head of the Pharmaceutical Department, Westminster Hospital, makes the following remarks with regard to tonic foods:

These are somewhat diverse in character. They may consist of simple nutritives, such as glucose, or "predigested" foods, or malted milk powders. Another group is based on extract of malt combined with cod liver oil or vitamin concentrates, or with iron. Soluble casein with calcium glycerophosphate is the composition of another well-known tonic food. Meat extracts and yeast extracts are often regarded as tonics; they have a negligible food value but exert a stimulating effect on the stomach, while the yeast extracts are a valuable source of vitamin B. Apart from the latter class, the essential ingredient of most of the foods is one or another of the sugars. Sugars form a readily absorbed fuel-food, differing, of course, from the starches in that they make no demand upon the amylolytic power of the digestion. The rapid combustion of sugar in the circulation furnishes a quick source of energy and a nourishing tonic to the myocardium, the great muscle mass of the heart. It also promotes fat metabolism and reduces strain on the oxygen capacity of the organism.

Several varieties of tonic cereal foods have comparatively recently made their appearance on the market; the following is the approximate analysis of one of the most popular of these:

Protein	13·5 per cent.
Fat	5·8 ,, ,,
Starch	42·6 ,, ,,
Sugars	32·3 ,, ,,
Calcium, phosphorus, iron, and other mineral ingredients	5·7 ,, ,,

ARSENIC IN CRUSTACEA

CRABS naturally contain arsenic. So do lobsters, shrimps, and cod liver oil, all of which often have 100 times the amount found in agricultural products, according to Dr. Arthur D. Holmes, of Boston, and Dr. Roe E. Remington, of the Medical College of South Carolina.

INVENTING A NAME

ONE of the most useful advisers it has been our pleasure to handle is a book entitled *Trade Names*.*

The book is obviously built around a set of four very ingenious trade-finding devices. A set of four discs carrying suitable letters and combinations of letters is provided, and by revolving the discs a set of names, every one of which would appear to be suitable for some particular product, is produced.

The combinations must run into many thousands. There is a set of four such discs provided with each book, and we are convinced that anyone trying to find a trade name could not possibly do it so well without these discs as with them.

The first half of the book consists of a general dissertation on the method of approaching the subject, with a great many illuminating examples. A chapter is devoted to the proper use of the discs already referred to, and the latter part of the book consists of English and American legal requirements.

The book is absolutely excellent value for 6s., and we consider that any food manufacturer who either now or at any future time wishes to find a new name for his product should immediately send 6s. to his bookseller and secure a copy of this publication.

W. L. H.

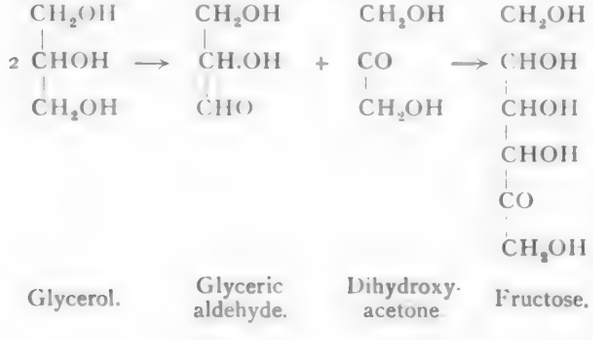
* *Trade Names*, A. H. Cousins and H. E. Wadsworth. Price 6s. 74 pages plus 12. Demy octavo.

SYNTHETIC SUGARS

Will the food manufacturer ever be independent of the farmer for his supply of raw materials? Will he become a chemist synthesising the sugars, proteins, and fats which he requires, without having to depend entirely on the soil and weather? Perhaps the distant future holds some such possibility in store, but we have still a long way to go before that stage in food history is reached, as the reader will gather from the following remarks by Dr. C. A. Redfarn.

ALTHOUGH SYNTHETIC sugars have been known to the scientific world since 1887, when the first specimens were obtained by Emil Fischer, the various processes by which these sugars can be prepared are still of no commercial value. This is no reason, however, why the subject should be ignored, for there have been many academic discoveries which were at one time described in the current textbooks as being of scientific interest only, and which have since become the bases of thriving industries. For example, the plastics industry, which seems to have captured the imagination of sensational journalists, is to a large extent based on the reaction between phenol and formaldehyde to give a resin. This condensation was common knowledge to students of chemical publications, but there were no commercial developments of it until the beginning of the present century, when phenol and formaldehyde became available at reasonable prices.

In the historic sugar syntheses of Fischer and his pupils adaptations of ordinary chemical methods were employed. For instance, fructose was prepared by oxidising glycerol to a mixture of glyceric aldehyde and dihydroxyacetone, followed by polymerisation with dilute alkali:



In the living plant, such as the sugar cane, these relatively cumbersome reactions do not take place. Instead, carbon dioxide is absorbed from the air by the leaves, and it combines with water with the evolution of oxygen to give sugar, according to the following reaction:

$$6CO_2 + 6H_2O \longrightarrow C_6H_{12}O_6 + 6O_2$$

This takes place in the plant only under the influence of sunlight; hence the production of sugars from carbon dioxide and water by means of light is known as photosynthesis. The problem of reproducing this process in the laboratory without the aid of the living plant has been extensively investigated in the laboratories of the University of Liverpool by Professor E. C. C. Baly and his pupils. The writer had some personal connection with this work, and hopes that a few first-hand impressions of it will be of interest.

Mercury-vapour ultra-violet lamps were used as the source of light, the sun being unreliable and of course beyond control as regards duration and intensity of its light rays. Ordinary glassware could not be used as reaction vessels because ultra-violet light, the active principle for photosynthesis, is not transmitted by glass. Hence quartz containers or glass containers with quartz windows were used. In the early experiments carbon dioxide was bubbled through distilled water in order to provide the reaction mixture. It was first established that the initial reaction between carbon dioxide and water was the formation of formaldehyde and oxygen, the formaldehyde immediately polymerising to a sugar body of some sort:

$$H_2O + CO_2 \longrightarrow CH_2O + O_2$$

$$6CH_2O \longrightarrow C_6H_{12}O_6$$

After that it was more convenient to use formalin, a 40 per cent. solution of formaldehyde, as the starting-point. By exposing formalin, with certain refinements such as temperature control, agitation, *p*H adjustment, etc., to the rays from the quartz mercury lamp for about 600 hours, the resultant liquor had a sugar content of about 5 per cent., as shown by Benedict's test. This liquor, after some preliminary treatment, was concentrated *in vacuo* to give several pounds of a product not unlike "golden syrup" in appearance. By laborious methods, including oxidation of the syrup to sugar acids followed by hundreds of fractional crystallisations of the alkaloid salts of these acids, the presence of glucose and fructose in the photosynthetic syrup was demonstrated. It is interesting to note that, out of the large number of hexose sugars known, glucose and fructose, the most commonly occurring sugars in nature, should also be the ones produced in the laboratory.

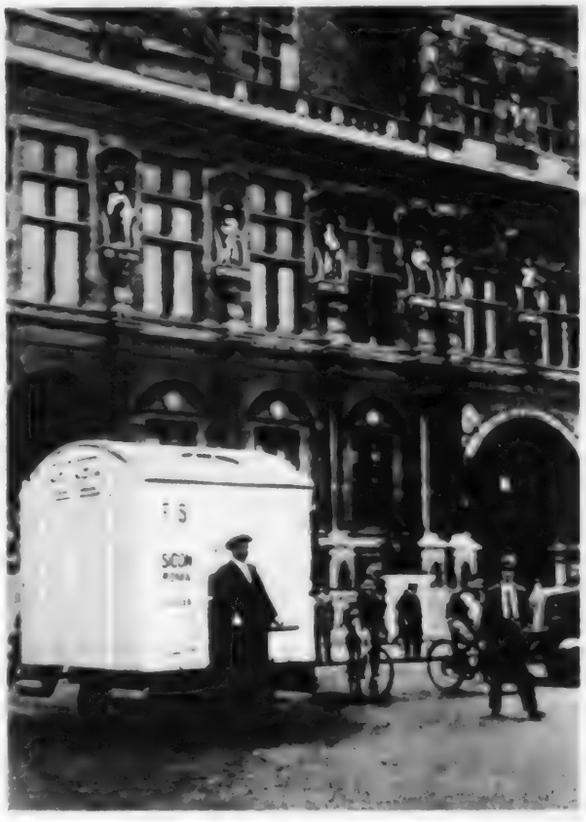
Later work at Liverpool has been in the direction of the production of sugar-like bodies from carbon dioxide and water in the presence of coloured surface catalysts by the action of ordinary white light. Positive results have been reported, but it would appear that the technique employed is of an extremely sensitive nature, since independent investigators elsewhere have not been able to confirm these later results.

Refrigerator Containers in Italy

By F. Karpeles

AN ENTIRELY novel system for the transport of fresh fruit and vegetables has recently been evolved by the Società Italiana Casse Mobili (SICON) and is now widely in use on the Italian State Railways. The system consists in the utilisation of specially constructed containers which on account of their light weight are easily transported from one place to another when fully loaded, whilst other containers house the pre-cooling plant, an electric transformer and converter station and a complete ice-making plant. A small petrol-driven truck on wheels is sufficient to carry a loaded container through the streets, as shown in the first illustration. The possibility of bringing the containers, and where necessary the pre-cooling and ice-making plant, right to the orchard where the fruit is picked is, of course, a very considerable advantage, as it prevents repeated handling of the fruit and ensures loading under the most favourable conditions.

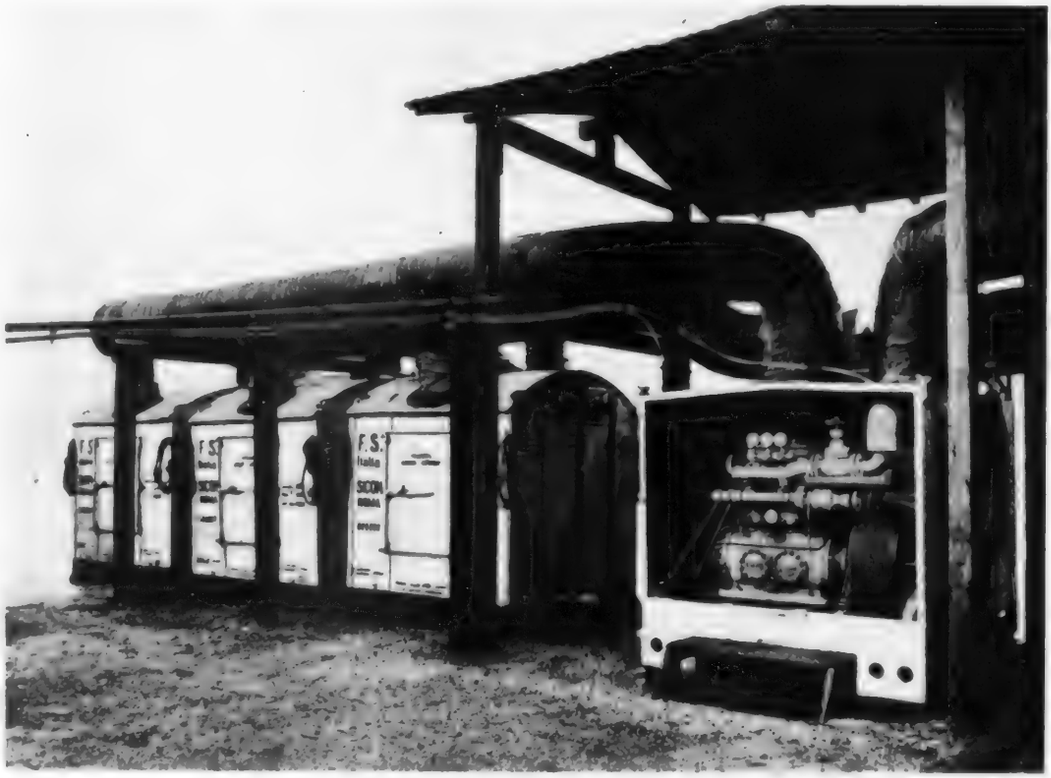
The containers have outer dimensions of 7′ 2″ × 8′ 8″ × 6′ 8″/8′ 4″. As can be seen from the second illustration, they rest on four legs, thus making it possible to lift them and place them on rollers when a small motor tractor is used, or on a petrol or electrically driven truck which is pushed underneath. The containers are built of welded steel plates, forming a double wall, the interspace being filled for insulating purposes with expanded cork slabs. Two ice boxes of a capacity of 150 kgm. ice each are fixed below the roof, which can be sealed hermetically. Goods are loaded through the door at one side of the container only. The ice tanks have a corrugated bottom so as to increase the cooling surface. It is interesting to note that contrary to general practice with refrigerating vans where the melted ice discharges, the ice water in the containers remains in the ice boxes at a practically constant temperature of 32° F. In order to maintain the temperature of the loaded container at the required low level over a period of five days without the necessity of refilling the ice boxes it is necessary to pre-cool the loaded containers. This is done by means of a pre-cooling plant which is housed in another container. This last is capable of pre-cooling six containers at the same time, three being placed on each side. The third illustration gives a clear idea of this arrangement and shows the pre-cooling plant, which consists of an electrically driven ammonia compressor, tubular condenser with pumps for the circulating water, radiator for the compressor and liquefied ammonia, serpentine evaporator, and two electric fans which can be driven in either direction. The plant has a capacity of 65,000 frig.-hrs. As will be seen from the illustration, the loaded containers are brought beneath a double row of conduits which are connected by vertical branches with each container through the roof. The cold air is driven into the containers by one conduit and exhausted through the other one. In order to ensure uniform cooling the



A Container loaded with fresh Peaches driving through Paris.

fans are reversed from time to time. The pre-cooling operations take several hours. In cases where no facilities are available to connect the pre-cooling plant to an electric supply station or suitable voltage cable, special containers housing a transformer and converter plant are used. This can be connected with any high tension line or any power station on one side and with the pre-cooling container on the other side. Where no ice is obtainable, as in many of the outlying districts, the ice-making plant, housed in another container, comes into use; this plant is of a novel type, and consists mainly of an apparatus in which cold water is sprayed on the inner side of a drum, where it solidifies to a hard snow, which is removed by rotary scrapers. The capacity of this plant is 300 kgm. per hour.

Front view of loaded Container.



The Pre-Cooling Plant, showing method of connection. The conduits on the right are connected to three containers which are not shown.

ORGANISATION OF FRUIT INDUSTRY

FROM many parts of the country reports are coming in of a glut of fruit that cannot be sold or is sold for a negligible return, says *The Daily Telegraph*.

The fine season is "blamed." But in a season that is not so kind the same thing happens, the cause being then attributed to the lowered quality of the fruit. The first-class grower and packer is seldom the man to make these complaints, for in good seasons and in bad he gets his price because the salesman wants his stuff.

The moral is obvious; it is the haphazard, careless grower, the bad packer, who is the enemy not only of himself but of the whole industry. Our fruit industry, in other words, needs self-organisation as much as any other, and quality and grading must be part of that organisation.

There are few branches of agriculture in which there would seem to be brighter prospects for this country than that concerned with fruit. In many lines, particularly in apples, we can produce the best, and the consumption of fruit shows every indication of expanding rather than declining. But organisation is plainly needed because "fruit" covers a very wide field. It embraces, for instance, canning and jam making, considerable industries in themselves with very special needs of their own.

The solution of the problem is becoming the more pressing on account of the satisfactory increases of late in our fruit acreage—this year our orchards have grown by 5,100 acres, our small fruit by 1,100 acres. It would be a very great pity if this expansion were to be checked.

Milk in Bread?

Experimental Data from Patrick J. Shortt.

Although we stated in the September issue that Mr. Shortt's experimental results and reply to Mr. Bennion would be followed by a "summing-up", the discussion has created so much interest among bakers that we have been constrained to accept yet another "instalment". Further remarks from Mr. F. E. Thomas await publication.

MR. EDMUND B. BENNION, Master of the National Bakery School, London, steps into the "milk in bread" controversy. His entry makes up a foursome all at odds with each other on this subject. In his article Mr. Bennion points to the results of the investigations made by himself and Mr. Rees-Jones, of Wrexham, on the use of milk in bread, as conclusive. Rees-Jones, in his report, states definitely that, displacing 6 gallons of water in the dough with 6 gallons of milk, the half-quartern loaves may safely be scaled ½ oz. lighter; but Bennion disagrees and says it depends on other conditions than just scaling. So he is at odds with his own co-worker. It seems that "if you convince a man against his will he's of the same opinion still."

In connection with these investigations I would like to point out that 6 gallons of milk does not replace 6 gallons of water. It replaces only 5·4 gallons of water, because of the solids in the milk. To replace 6 gallons or 60 lb. of water in the dough with milk would require the use of 68·57 lb. of milk, which carries into the dough also 8·57 lb. of solids. These solids must be hydrated to bring about proper dough consistency. It will require about 9·8 lb. of milk to do this; therefore the total of milk required to replace the 60 lb. of water in the dough and properly hydrate the milk solids carried in is roughly 7½ gallons. This, perhaps, did not occur to Mr. Bennion when he carried out his experiments to determine the results and costs of using milk in bread. He states: "It was, however, considered that dried milk was the most suitable form in which to use milk. This is largely the practice to-day, and for the past ten years increasing amounts have been consumed in the bakeries of this country, and so promising has been the market that this country has become the dumping-ground for milk powder from all parts of the world."

In so far as this statement accurately represents the true state of affairs, this is not due to any scientific advice the baker has been given. I have pointed out before that the baker himself is blazing the trail to milk in bread in his desire to perfect his product. He may not be endowed with a scientific mind, but as a rule he has good hard common sense, and finds out for himself the things that make bread better.

Speaking of bread made with milk, Bennion says that food publicists are backing the wrong food as a means of introducing milk to the people. Now he should know that bakers are interested only in introducing good bread to the people. They are not concerned about introducing yeast or flour or fat or milk, but good appetising wholesome bread, and Mr. Bennion's own description of a milk-made bread warrants the more general use of milk by the baking trade.

As a dietitian Mr. Bennion is out of his depth, and rather than accept his unscientific opinion on the value of milk bread in nutrition I am inclined to accept those of noted nutritionists who agree that the simplest, cheapest, and most effective way to improve the quality of bread is to introduce more milk solids-not-fat into its composition.

Delving into a realm with which he is unfamiliar, he points out that if milk powder comes to be employed to a greater extent we shall find the millers and wheat producers bemoaning the decreased consumption of flour. The answer to that is: The most prominent millers in the United States advocate the use of milk powder in bread and assist greatly in educational programmes towards that end. He asks then: What about the farmer, who will lose on wheat what he makes on milk? Well, who cares about what the farmer loses or gains? Better bread is the question, and Mr. Bennion himself admits that far better bread is produced with milk than without it, but questions the economic phase.

In this connection he asks what authority I can give for my statements concerning fermentation and baking losses and also for the saving of 1 oz. in scaling half-quartern loaves.

As Mr. Bennion has questioned his own findings in this respect, he would certainly question the findings of any authorities I might give him. There are authorities here in London, well known to Mr. Bennion, who, using milk in the production of their bread, will substantiate the statements I have made.

However, I will set forth here the results of experiments

recently made by me in collaboration with a prominent London Food Chemist and his assistant baker, as an answer to Mr. Bennion's doubts on the economic side of the question. This work was carried out for private information, so I am not at liberty now to disclose the names of my collaborators or the baking laboratory where the experiments were conducted. The doughs were mixed at 80° F., fermented and proofed in a thermostatic control cabinet at 82° F. and 85 per cent. relative humidity, scaled at 37 oz., split into two 18½-oz. pieces, and panned separately. They were baked in an electric oven at 450° F. for forty-five minutes, then cooled before weighing. The milk-made doughs contained English separated milk powder in approximate proportions of 3%–4% and 5%, together with an increased amount of water equivalent to 4½%–6% and 7½% respectively. Separated milk powder indicated in formulæ as M.S.N.F. (milk solids not fat).

Formulæ.

	No. 1. Water Bread (Grams.)	*No. 2. 3 Per cent. M.S.N.F. (Grams.)*	*No. 3. 4 Per cent. M.S.N.F. (Grams.)*	*No. 4. 5 Per cent. M.S.N.F. (Grams.)*
Flour ...	1332·45	1332·45	1332·45	1332·45
M.S.N.F.	—	39·69	51·03	66 62
Water ...	770·00 c.c.	819·00 c.c.	836·00 c.c.	860·00 c.c.
Salt ...	16·00	16·00	16·00	16·00
Yeast ...	24·00	24·00	24·00	24·00
Dough	2142·45	2231·14	2259·48	2299·07

Mixing, Fermenting, and Baking.

Mixed	10.10 a.m.	10.50 a.m.	11.05 a.m.	11.20 a.m.
1st down ..	11.40 a.m.	12.25 p.m.	12.40 p.m.	12.55 p.m.
2nd down ...	12.15 p.m.	1.05 p.m.	1.15 p.m.	1.35 p.m.
Panned to proofer .	12.20 p.m.	1.10 p.m.	1.20 p.m.	1.40 p.m.
To oven .	1.05 p.m.	1.55 p.m.	2.10 p.m.	2.25 p.m.
Baked .	1.50 p.m.	2.40 p.m.	2.55 p.m.	3.10 p.m.

Weights and Losses.

Weight mixed	75·57 oz.	78·70 oz.	79·69 oz.	81·09 oz.
Weight baked and cooled ...	63·87 oz.	69·13 oz.	71·34 oz.	73·29 oz.
Loss	11·70 oz.	9·57 oz.	8·35 oz.	7·80 oz.
Percentage Loss	15·47	12·16	10·47	9·62
Scaled 37 oz. 2 lb. loaf weighed	31·9375 oz.	33·00 oz.	33·3750 oz.	33·4375 oz.
Weight of milk loaf over water loaf scaled at same weight	—	1·06 oz.	1·43 oz.	1·50 oz.

Figures applied to 280-lb. Flour Batch.

Flour	280·00 lb.	280·00 lb.	280·00 lb.	80·00 lb.
M.S.N.F. ..	—	8·34 ,,	10·72 ,,	14·00 ,,
Water	161·81 ,,	172·00 ,,	175·60 ,,	180·70 ,,
Salt	3·36 ,,	3·36 ,,	3·36 ,,	3·36 ,,
Yeast	5·00 ,,	5·00 ,,	5·00 ,,	5·00 ,,
Dough	450·17 ,,	468·70 ,,	474·68 ,,	483·06 ,,
Yield 2 lb. loaves	190·00	205·8	212·5	218·00
Extra yield 2 lb. loaves	—	15·8	22·5	28·00

The volume of the 3 per cent. milk loaf was smaller than the water bread loaf, but the 4 per cent. milk loaf appeared equal in volume to the water bread loaf; however, on measurement with tape it was slightly smaller, whilst the 5 per cent. milk loaf was practically equal in volume to the water bread loaf. This shows the incorrectness of Mr. Bennion's view that the greater the amount of milk solids added the smaller will be the volume of the loaf and the closer and more solid the crumb.

The milk bread loaves all had the characteristic appearance of milk bread—better symmetry of form, better crust and crumb, colour, and texture than the water bread. There was no indication whatever of what Mr. Bennion termed a solid crumb that satisfies too readily. The English palate, which Mr. Bennion speaks of as being so different, and for which he presumptively limits as adequate 1·8 per cent. milk solids in bread, would appreciate this 4 or 5 per cent. milk-made bread and call for more.

Correspondence

To the Editor.

Sir,

When examining samples, such as the dye to be used for the tinting of the green grass growing around the base of Mr. Parker's hunting cakes, one feels that a little sympathy is due to the food manufacturer against the cruel definition of a food as given in the Food and Drugs (Adulteration) Act, 1928, which states:

"The expression 'food' includes every article used for food or drink by man, other than drugs or water, and any article which ordinarily enters into or is used in the composition or preparation of human food, and also includes flavouring matters and condiments."

The unfairness of this definition appears to be emphasised when taken in conjunction with the recommendations of the Royal Commission on Arsenical Poisoning, 1903, which suggest that it shall be an offence against the Sale of Food and Drugs Acts to sell solid food containing 1/100 grain or more of arsenic per pound.

I am not, however, surprised to learn from my learned friend Mr. Potter that prosecutions have taken place for amounts of arsenic of 2 grams per pound, or less, of baking powder, since, as a chemist, I would even suggest that the arsenic present in this quantity might be recovered as a by-product.

Yours faithfully,
Thomas McLachlan.

Industrial News

NEW WORK ON RUSTLESS STEEL—A NEW GRINDING MILL—ECONOMICAL COLOUR PRINTING—ROPE DRIVES—TRADERS' DEFENCE ASSOCIATION—A NEW SIFTER—EAST AFRICAN FOOD EXPORTS

New Work on Rustless Steel

There was a period when it seemed as if progress in stainless steels was slackening in pace, but the last twelve months have definitely proved that inventive and expert minds are at work, and some interesting and valuable metallurgical discoveries have been recorded in this field.

A Swedish professor has made an interesting discovery in connection with stainless steels. He has found that by adding percentages of silicon and copper to the standard austenitic nickel chrome stainless steels he has succeeded in raising the corrosion-resistance of stainless steel to a very high degree, while at the same time increasing the wearing strength. The carbon content is a little higher than in the standard analysis. Nickel content is about 25 per cent., with 3 per cent. silicon, 3 per cent. chrome, and 1·5 per cent. copper.

A stainless and heat-resisting steel containing 20 per cent. nickel and 25 per cent. chromium has proved eminently satisfactory for service under conditions requiring a higher resistance to scaling than is given by the standard 18/8 stainless steel (18 per cent. chrome, 8 per cent. nickel).

A most valuable discovery has been that of the influence of nitrogen on the chromium and nickel chromium stainless steels. Parts made from stainless steel which has been alloyed with nitrogen in amounts of from 0·2 to 0·3 per cent. will stand up to severe wear without cracking, are more readily machinable, are non-magnetic, have a relatively high strength, and, where the carbon percentage is low, a great amount of ductility and toughness, high yield point, and high resistance to both staining and corrosion. The nitrogen is added to the steel in the form of high nitrogen ferro-chromium.

In connection with the foregoing, we have received from the United Steel Companies, Ltd., of Westbourne Road, Sheffield, an interesting and extremely attractively presented brochure describing the "Silver Fox" range of stainless steels.

These have been designed to overcome many of the difficulties associated with the use of stainless steels, particularly as regards ease of manipulation and resistance to the attack of various types of corrosion and to weld-decay. "Silver Fox" stainless steels are made by the high-frequency electric process; they are claimed to be uniform in structure and remarkably free from non-metallic inclusion.

Particulars of composition, uses, heat treatment, and mechanical properties, as well as results obtained under typical test conditions, are given for each of several series of steels, and at the end of the brochure will be found notes on soldering, brazing, welding (no stainless steels will smith weld, but all "Silver Fox" steels may be gas or electrically welded), and data concerning the heat treatment required after welding.

Readers contemplating the use, or extended use, of stainless steel equipment in their factories would be well advised to obtain a copy of this brochure and study it.

▼ ▼ ▼

A New Grinding Mill

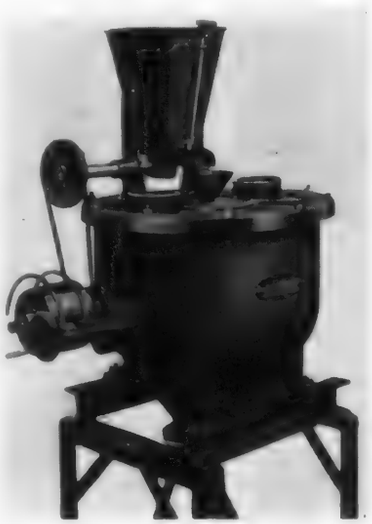
A very attractive machine turned out by the S.O.S. Patents Co., Ltd., is the "Reddrop-Periflo" Centrifugal Grinding Mill, illustrated here. This machine is skilfully designed on the pinned disc principle, and is constructed without restricted passages or lugs at the periphery of the discs. It has been designed to grind efficiently up to 300 mesh, and for easy running on a low power. It is entirely automatic, and all parts are easily accessible for cleaning. The machine has an automatic feeder self-contained in the mill and the discs can be changed in a few minutes. The grinding pins are of manganese steel, specially heat-treated, and are renewable individually.

Clogging, metal contamination, and deterioration are entirely eliminated by the rapid and efficient grinding and the free peripheral discharge.

The "Reddrop-Periflo" Mill is made in varying sizes to suit the needs of different industries. A very small size is available for colour manufacturers, enabling a battery of mills to be installed at a reasonable cost, keeping each machine more or less on the same colour.

The mill can be used for damp or sticky materials such as gum, etc., and the risk of clogging is reduced to a minimum, a flow of air through the machine ensuring no great increase in temperature of the material and the aeration of the final product.

Blending of materials is efficiently performed by the mill and the delivered product is an absolutely homogeneous blend—not an ordinary mix.



Tyres v. Cartwheels

We have received a folder published by the India Tyre and Rubber Co., Ltd., dealing with pneumatic tyres for horse-drawn vehicles. It is claimed that pneumatic tyred wheels enable the horse to draw greater loads without bigger effort, and this comparatively new development will be of interest to milk and bread distributors, farmers, and others.

The tyres are specially built to meet the particular requirements of this form of transport.

The folder is very attractively produced, and gives prices of the different sizes of tyre, with suggestions as to suitability in relation to laden weight per axle; also particulars and prices of conversion equipment and hints on maintenance.

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Correction

We should like to inform our readers that the telephone number of Messrs Durex Abrasives, Ltd., Arden Road, Adderley Park, Birmingham, is East 1605, and their telegraphic address is Durexives, Birmingham.

Owing to printers' errors these particulars appeared incorrectly in Messrs. Durex's advertisement in our September issue.

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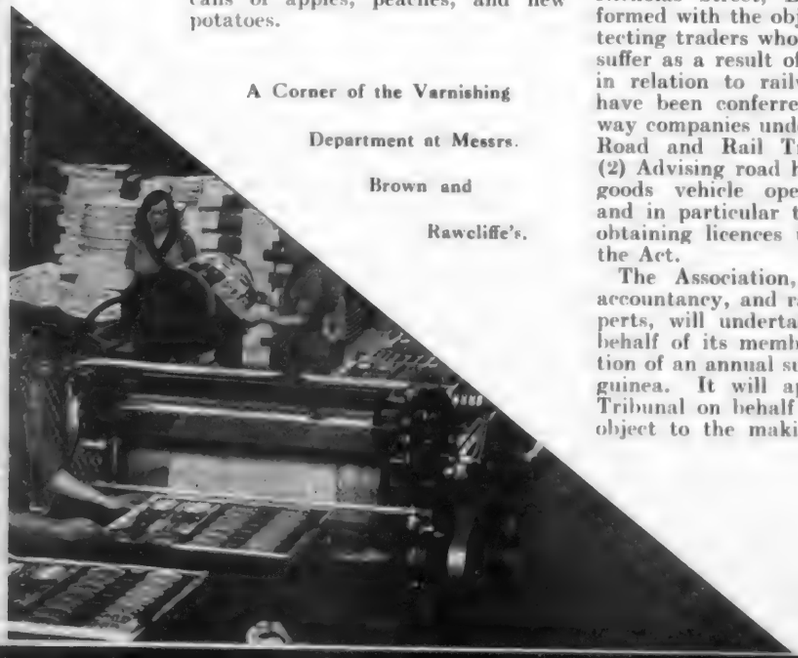
Economical Colour Printing

Labels and cartons normally requiring six or seven colours can, it is claimed, be reproduced perfectly in a greatly reduced number by the "Lithesk" process, a new idea in offset litho printing developed by Messrs. Brown and Rawcliffe, Ltd., of Aintree, Liverpool.

Many food manufacturers are already using cartons and labels printed the "Lithesk Way"; cartons for tea, cheese, sultanas, raisins, and dates bear names which are household words, printed by this process, and "B.R." labels carry equally familiar names on wine and chutney bottles, marmalade jars, and cans of apples, peaches, and new potatoes.



A Corner of the Varnishing Department at Messrs. Brown and Rawcliffe's.

Rope Drives

We have received from Messrs. Crofts (Engineers), Ltd., of Thornbury, Bradford, a copy of their new catalogue of Sure-Grip VRope Drives. The wide variety of endless ropes in each standard section is clearly shown, and tables have been drawn up so that any combination of VGrooved Pulleys and Ropes can easily be selected for drives of any ratio up to 7 : 1 and in a wide range of centre distances.

The range of drives obtainable from stock, covering powers from fractional horse-power up to 50 h.p., are listed, and sections are devoted to VFlat Drives, complete Reduction Drives, Constension Drives, etc. Numerous illustrations show all sorts of industrial conditions under which these drives have been employed.

This catalogue will be found a valuable aid to power users, plant engineers, designers, etc., and an important point to note is that all Sure-Grip Drives are guaranteed.

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Traders' Defence Association

Prior to January 1, 1934, the charges made by the railway companies for the carriage of goods and merchandise were fixed on a ton-mile basis according to distance and class of goods carried. The railways were bound by law "To accord no undue preference to any person, company, or description of traffic".

The Road and Rail Traffic Act of 1933 changed all this. The railways may now quote "flat" rates per ton, irrespective of distance. Large concerns who may obtain "agreed charges" will thus be in a position to deliver their goods into districts which previously they were unable to approach, and in some cases a small trader may be placed at a disadvantage in competing in his own home market.

The Traders' Defence Association, whose address at present is 37, St. Nicholas Street, Bristol, has been formed with the objects of: (1) Protecting traders whose businesses will suffer as a result of the new powers in relation to railway rates which have been conferred upon the railway companies under Part II. of the Road and Rail Traffic Act, 1933. (2) Advising road hauliers and road goods vehicle operators generally and in particular to assist them in obtaining licences under Part I. of the Act.

The Association, with its legal, accountancy, and railway rating experts, will undertake this work on behalf of its members in consideration of an annual subscription of one guinea. It will appear before the Tribunal on behalf of members and object to the making of an agreed charge or apply for a charge to be fixed in a member's favour. Although this is the initial and primary object of the Association, it does not propose to limit its activities to these matters in the future, but will deal with all problems affecting the smaller trader, such as licensing difficulties, etc.

It will be appreciated that the larger the Association the greater its power to protect its members.

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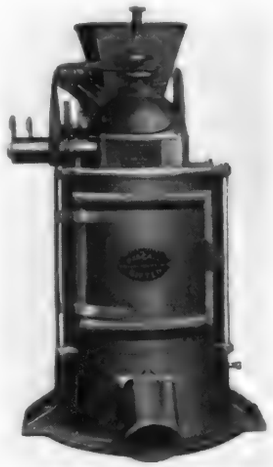
A New Sifter

Great interest attaches to the "Pascall" High-speed Turbine Sifter (S.O.S. Patents Co., Ltd., London), an illustration of which is shown here.



A distributor, suitable for all products, at the input of the machine, ensures even distribution of the raw materials to the rotors, and a special arrangement at the feed tray prevents the entry of any foreign matter which may damage the screens.

Control of the machine is simplified by the rate of input being synchronised with the speed of the turbines. Sifted product (fines) passes through the base for bagging or collection, while the coarser material (tailings) is delivered from a side outlet.

The rotors sweep the product at a constant angle against the sifting cloths, which may thus have a mesh 20 per cent. coarser than the degree of fineness required, thus reducing initial cost of screens and maintenance costs and ensuring longer life.

Finished products are delivered consistently and to a standard of fineness hitherto unobtainable—exceeding over 300 fine.

The S.O.S. Patents Co., Ltd., who are the manufacturers of this outstanding machine, have installed a testing station in London, at which tests of various products for prospective clients are constantly being carried out.

N.I.I.P. Classes

Two courses, each of ten discussion classes, have been organised by the National Institute of Industrial Psychology, to be held at their offices in Aldwych House, Aldwych, London, W.C. 2. The subject of the first course is The Engagement, Training, and Supervision of Workers, and the classes will be held at 6.15 p.m. on Tuesdays, starting on October 2, 1934. The course is planned for labour managers, departmental managers, welfare superintendents, foremen, and forewomen.

The second course is concerned with Conditions and Methods of Work, and these classes also will be held at 6.15 p.m. on Tuesdays, starting on January 15, 1935. The course is planned for managers, technicians with administrative functions, foremen, and forewomen.

The fee is £4 for both courses or £2 5s. for either course: these fees are reduced for Members of the Institute. A synopsis of the courses and full particulars can be obtained from the Secretary of the National Institute of Industrial Pyschology.

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East African Food Exports

According to the Department of Overseas Trade report "Economic Conditions in East Africa (April, 1932 to March, 1934)", *coffee* output in Kenya for 1933-1934 (estimated) showed a reduction on 1932-1933, but this was caused solely by drought conditions, which were also responsible for a poorer quality of yield. The estimated output in Tanganyika for 1934 is almost the same as for 1932, showing a slight drop on 1933; while in Uganda figures for 1934 are not available, 1933 showed a distinct increase on 1932.

Cereal production in Kenya has been much impeded by a series of misfortunes. The destruction of crops by locusts prevented advantage being taken of good market prices; these had fallen when improved crops were available, and finally in 1933 drought conditions reduced yields. The production of 996,140 bags (estimated) of *maize* for 1933 compares with 1,139,616 bags in 1932. It is estimated that the 1933-1934 *wheat* crop will provide approximately 175,000 bags as compared with 63,500 bags in the preceding year; this is due to the sowing of a greater acreage to wheat in 1933. It is hoped that greater acreages will be sown to both crops in 1934.

The good crop of *cloves* in Zanzibar during 1931-1932 was, as is normal, followed by a smaller crop in the succeeding year. The expectations of a normally larger crop in 1933-1934 have been disappointed to some extent by drought, although exports in 1933 were above the average. The effects of the 1933 drought on the trees makes estimation of the 1934-1935 crop very difficult. Efforts are being concentrated on the intensification of the production side of the industry in order to obtain an improved article. Plant breeding and selection of trees are being attended to, and investigation of marketing conditions and grading systems will follow.

Butter exports from Kenya increased ten-fold from 1929 to 1932, but there was a slight fall in 1933 owing to the effects of drought on pasturage conditions.

The production of *tea* in 1933 was as follows:

	Lb.
Kenya	3,212,083
Uganda	65,068
Tanganyika	41,157

of which 17,462 cwt., 269 cwt., and 1 cwt. respectively were exported overseas.

Sugar now enters the list of domestic exports with shipments in 1933 to England. An exportable surplus of 10,000 tons is foreshadowed for 1934. Local production in 1933 was as follows:

	Tons.
Kenya	7,781
Uganda	15,000

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Training University Graduates for Business

The Department of Business Administration was established at the London School of Economics in 1930 through the joint efforts of leading business firms and the school authorities. Its principal work is to provide selected students, whether under the University Scheme described below or unattached, with full-time training in the broad principles of business administration.

Last summer the Department started an important development in the recruiting of trained men for business with the backing of nationally known firms. This summer a number of outstanding firms are offering about a dozen appointments to University graduates selected by them and approved by the Department, on condition that they attend the Department's special course of business training during the coming academic year, which opens this month and ends in June, 1935.

This arrangement is known as the Department's University Scheme. It has been devised to overcome some of the difficulties which in the past have hampered the training of future executives in business principles and methods. As a new bridge between business and the Universities, it has been welcomed by many firms in many trades. Thus, firms participating last year in the Department's University Scheme included a chocolate manufacturer, makers of office equipment, an engineering concern, a furniture manufacturer, a great public utility enterprise, and a department store. This year the industries represented include iron and steel, electrical equipment, engineering, non-ferrous metals, and large-scale retailing.

During the past three years nearly fifty students have passed through the Department's training. At the end of each session there has been a keen demand for students from firms wishing to recruit trained men.

The specialised business subjects which form the Department's main course comprise marketing, production, finance, and statistics, accounting and personnel management as instruments of executive control. The Department has broken the greatest amount of new ground in the fields of marketing, retail management, and sales management, where the teaching is based on fresh investigation of current practice. Special efforts are made to keep the teaching in the closest touch with reality through discussions opened by business men and visits to factories, shops, and offices.

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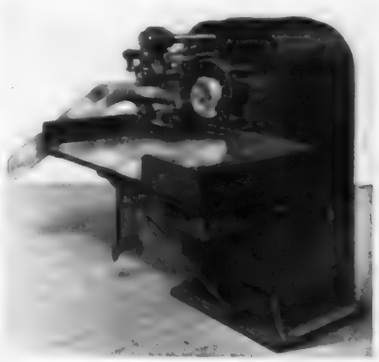
Fold and Twist Wrapping

The machine illustrated on this page has been specially designed by Messrs. Rose Brothers (Gainsborough), Ltd., of Albion Works, Gainsborough, to fold- or twist-wrap irregular-shaped boiled or buttered sweets, and has an output of 100 to 140 per minute. It requires only one attendant, and was on show at the exhibition described on another page.

Each feed plate will take a reasonable variety, in size and shape, of sweets, but when an entirely different kind has to be dealt with extra plates with suitable holes are available.

A feature of the machine is the simplicity of the change-over from fold- to twist-wrapping; this is effected merely by moving a lever and changing the reel of paper, although 5 to 10 minutes are usually required to make this change by other methods.



INFORMATION and ADVICE

Chicken Brawn—Smoked Sausages—"Vegetarian Meat"—Meat Paste—Mould—Onion Pickling—Pickling—Worcester Sauce—Sauce—Insecticides—Puffed Wheat—French Mustard—Free Running Salt—Beetroot Chutney—Grapefruit—Apple Pectin—Citrus Juices—Banana Products

Chicken Brawn

1,659. *We are having trouble with the setting qualities of our Chicken Brawn. The ingredients of the brawn are chicken, beef, and pork. The jelly we are using consists of 2 per cent. agar-agar, mixed with the above ingredients to the extent of 8 pints jelly to 7 lb. mixed meat. This is retorted in 1 lb. glass jars for forty minutes at 240° F. Can you suggest any means beyond a greater strength of agar jelly that will enable us to procure a harder setting jelly? We find that after about a fortnight this jelly is inclined to break down slightly and go "sloppy."* (England.)

The trouble seems to be due to an excessive amount of moisture in the pieces of meat after cooking and before filling into the jelly. The cooked meat should be well drained, mixed together, and then spread out on wire trays which are placed in a room at 120° F. for an hour, turning the meat over once during this period. It should not be necessary to use agar. Soak 20 lb. hard gelatin in 20 gal. water overnight. Sprinkle 2 lb. egg albumen on 2 gal. water and allow to stand overnight without stirring. Ten gal. water are next day placed in a steam-pan, the salt and spices added, and the whole brought to the boil. Cut off the steam and add soaked gelatin and water. Stir well and then add albumen and water and stir. Turn on steam and bring to boil, but do not boil. Skim and filter bright. Return to pan and bring to 200° F. Add the prepared meat, cap, and sterilise.

The enquirer was given recipes in connection with the above.

Smoked Sausages

1,660. 1. *Which institutes in the British Empire are actively engaged in meat research?*

2. *Does or did anyone conduct investigations dealing with dried smoked sausages and dried smoked meat, and where are published the respective English findings?*

3. *Does England have a large export of smoked dried sausages and meats, like salami, bologna sausages, etc., and which way of packing is mostly used for shipment? Is every piece wrapped separately in paper or the like?*

4. *Should dried smoked sausages and meats for export contain a limited amount of moisture in order to avoid moulding or spoilage during transport? Some of our shipments of salami sausages mould and spoil during shipping in spite of being well cured and practically dry at the time of packing, each sausage being wrapped separately.* (Warsaw.)

Information was supplied.

1,661. *Can you put me on to a source of information from which I may obtain guidance in the preparation of breasts of chicken for sale in glass containers, and the making of chicken essence in the form of jelly, both for the United Kingdom market?* (London.)

We think the best information is that which is contained in an article which appeared in our October, 1933, issue, entitled "British Poultry Canning," by T. Crosbie-Walsh.

If you do not happen to possess a copy of this issue, we should be very glad to send one on receipt of your order.

"Vegetarian Meat"

1,662. *Regarding a Chinese speciality called "Ajinomoto", said to be made from wheat or soya beans and known also as "Vegetarian meat", in one process the recipe calls for the use of hydrochloric acid. Does anyone know details of the manufacture of Ajinomoto?* (Poland.)

With regard to your enquiry about Ajinomoto, I take it that this is merely the crude product resulting from the proteolysis of the gluten content of wheat and soya beans induced by mould fermentation.

The process is carried out on a large scale in Japan, and we have described it in an article which we published in the May, 1933, issue, in connection with the preparation of soya sauce.

There are, of course, all kinds of modifications of the process, but they are much the same in that they depend on the hydrolysis of the proteins occurring not only in grain but also in fish and other products. The flavour which results is largely due to the formation of salts of glutamic acid produced in greater or less degree according to the point at which the process is stopped, the raw materials employed, and the particular manner in which the process is conducted.

The Germans make crude products which are used for flavouring purposes, imparting a meat flavour to the products in connection with which they are used.

In Japan there are people who carry out the process with the object of producing a pure mono sodium glutamate, and in England a patent was taken out—namely No. 347,258, accepted April 23, 1931, and entitled "An Improved Process for the Manufacture of Mono Sodium Glutamate and Glutamic Acid Salts."

Briefly, it relates to the manufacture of these salts from gluten derived from wheat, rice, and other sources, by its hydrolysis by means of hydrochloric acid. If you are interested you will find all the particulars in this patent.

We had a note on this subject in the February, 1932, issue entitled "The Meat Taste." American journals have also published several articles on the subject.

For success in soya fermentation (with the object of producing an intermediate product, koji, or the final soya sauce) careful selection among the multitude of strains with the general characters of the species *Aspergillus flavus-oryzæ* has made possible the use of strains in which proteolytic enzymes are produced in rather large amounts and carbohydrate splitting is reduced.

Meat Paste

1,663. *Please give us your advice as to how we may overcome the discoloration on the top surface of our meat pastes.* (London.)

Suggestions were made.

Mould

1,664. *Kindly give your advice on the question of the glaze on cooked ox tongue turning mouldy.* (England.)

A method for avoiding this was described.

Onion Pickling

1,665. *I am in the pickle trade and have had trouble with Egyptian onions causing a sediment in the bottles. I would be obliged if you could suggest a way of curing this. Also please give correct strength of brine.* (England.)

The sediment you mention is a common fault in pickling large cutting onions.

Carrying out the correct procedure will avoid this trouble, and care must also be taken to see that any contact with iron is strictly avoided.

Pickling may be done in several ways. For example, the following is one method:

Place 3 cwt. of the onions in a clean 50-gal. cask and head up. Fill up through the bung-hole with brine, and 2½ lb. of bay salt to each gallon of water. Store away for about seven days and ferment. After fermentation run off brine and introduce into the cask 2 oz. of bisulphite of lime. Fill up with fresh brine of the same strength as the previous one. Bung tight and store away for ten days, after which the onions will be ready for pickling. When required, run off the brine and fill up with water at 160° F. Stand for 24 hours. Repeat this operation three times so as to remove all the sulphite. Then fill up with a 4½ per cent. solution of acetic acid. Stand for 48 hours before cutting up for pickles, otherwise mould will set in. When packing the pickles into the glass jars, a 16-grain malt vinegar should be used.

Pickling

1,666. 1. *Is there any known method of pickling beetroot whereby the beet will not bleach after being bottled?*

2. *Can you supply a tested recipe for pickling beetroot?*

3. *Can you give us a good commercial recipe for the following pickles: Onions, Mixed Pickles, Cucumbers, Piccalilli, Walnuts, Red Cabbage, Fruit Chutney, and Vegetable Chutney?*

4. *The names of bottle and label manufacturers.*

5. *The names of dried pea merchants.* (Midlands.)

I am afraid that the questions you ask would require a whole book to deal with satisfactorily. By far your best plan is to secure the services of a practical man who has had works experience on these lines or a technical consultant who is familiar with works practice.

In the case of onions, for example, all depends on the type of onion intended for pickling. The same applies to cucumbers. For instance, brining and pickling Dutch onions, silverskin onions, Egyptian onions, and brining and pickling gherkins, chumps, and bastards all vary in detail. We have given information in back numbers on these subjects, and have also published recipes for the manufacture of piccalilli and various types of pickles.

As regards red cabbage, the great point here is not to use a vinegar which has been coloured. Try pickling with 80 per cent. acetic acid—that is to say, 3¾ gal. of acetic acid in 46 gal. of water—or else a pale malt vinegar, 24 grain, should be used. Casks should contain 32 gal. of vinegar to the shreds derived from 4 cwt. cabbage. If the proportion of vinegar is too low, the cabbage will be soft and lumpy. If it is too high the cabbage will be too sour. Close the cask and stand in a cool place for about a couple of weeks before using.

The general practice with regard to walnuts is to place the brined walnuts from the casks in baskets or trays, and stack them up in a steam chamber fitted with an open steam coil. Thoroughly steam for two or three hours until quite black and soft. Then make up a liquor from dark malt vinegar (24 grain), 5 gal., white sugar 15 lb., together with ginger, pimento, etc.

Boil this liquor and then add to it the walnuts immediately on removal from the steam chamber. Allow to stand until cold. Then add a mixture of ¼ gal. of vinegar and ¼ gal. garlic liquor. Allow to stand for 48 hours before filling into containers.

Then again with regard to chutney, there is such a very big variety of these that it is by far your best plan to engage someone to put you right on manufacturing operations, as it is not a question of recipes alone. If you will let me know what particular grade and type of chutney you are interested in I can supply you with a basic recipe.

For beetroot pickling, the beetroots are best baked, but they may be boiled. The colour should be good. After cooking plunge them into cold water. Then peel and cut up. Remove head from cask and place in the beetroot. To each 100 beetroots add 3½ lb. salt, 10 gal. vinegar, and cayenne and white pepper to give the desired flavour.

Boil gently the vinegar, salt, and peppers for three

minutes. Pour the solution at about 180° to 200° F. over the beetroot in the open cask. Allow to stand so that the phosphate may settle to the bottom.

Fill into glass containers. The vinegar should be run off from a tap so as to avoid disturbing the sediment, and then filtered before filling into jars.

A little dried ginger and a few peppers and allspices may be inserted in each jar. For a cheaper product the malt vinegar may be replaced by dilute acetic acid.

Worcester Sauce

1,667. *Kindly supply recipe for Worcester sauce.* (Lancs.)

This was done.

Sauce

1,668. *Can you give us a recipe for a good-class sauce, easily manufactured?* (England.)

This was supplied.

Insecticides

1,669. *Have you any information on the use of fluo-silicates as insecticides? It appears very difficult to obtain this information.* (England.)

I have had no experience with the use of fluo-silicates as insecticides, but have come across references in American literature from time to time.

Apparently these fluo-silicates have given promising results. Brightman, in July, 1931, said that sodium fluo-silicate mixed with lime has been used against the pink boll worm in Egypt and proved more effective than calcium arsenate dust, but caused greater injury to the plant, and a cheap inert carrier for the fluo-silicate is required in place of lime.

American patent, 1,901,960, March 21, 1933, deals with insecticides for woollens, in which sodium fluoride, sodium silico fluoride, and sodium aluminium silicate are mentioned as toxic agents. The feature of this patent is the use of sodium tauro-cholate and sodium glyco-cholate to assist rapid penetration of the insecticidal solution into the fabric.

Another American patent, 1,863,266, June 14, 1932, refers to the preparation of insecticidal substances containing double fluorides of the alkali metals with aluminium.

Other sources of information were suggested.

1,670. *I have a seaming machine. Will you kindly say how I can can bread and suet without heat being applied? If a vacuum is necessary kindly say if a Millwall oven will suffice; also if the suet and bread will keep in a can (ground bread and shredded suet).* (Birmingham.)

Information was supplied.

Puffed Wheat

1,671. *Can you supply any information on the preparation of puffed wheat?* (Bombay.)

We cannot supply any detailed information. In a general way, the procedure involves first the scouring off of the surface branny layers and then puffing the grain. The latter process is accomplished by impregnating the grain with the requisite amount of moisture, heating it in a pressure retort and then suddenly releasing the pressure. If the right type of grain has been selected, and the requisite amount of moisture has been introduced, and the retorting has been carried out at the correct temperature and pressure, the fortunate manufacturer will be rewarded with a "puff", in somewhat the same manner as pop-corn "pops". As a matter of fact, we are ourselves looking for this information, but, in any case, even if we had it in our pocket, so to speak, it would not obviate the necessity for running trials on a small scale, since the factors enumerated above would be expected to vary according to the inherent characteristics of the particular variety of wheat selected as the raw material.

It will perhaps be recollected that a couple of years ago Brunson and Bower, of the U.S. Department of Agriculture, looked into this matter with the idea of finding out how the "poppability" of corn is influenced by the character of the grain. They found that some corns would not pop at all—namely, "flour corn"—and that "pop corn", with the greatest proportion of hard starch, is far better than others—*e.g.*, flint corn and dent corn—in respect of poppability. The reason for this is clear. For corn the best moisture content lies between 13 and 14 per cent. Another factor which has to be given attention is the manner of application of the heat.

French Mustard

1,672. *I am anxious to get a recipe for making up French mustard, and wondered whether you can give me your kind assistance in the matter.* (London.)

This information was supplied.

1,673. *I am interested in introducing sauce into my pickle trade, and would be obliged if you could send me a recipe for a cheap sauce.* (Lancs.)

This was done.

1,674. *Will you please favour me with some information regarding British sweets called "Voice and Cough"?* (U.S.A.)

Some information was supplied.

Free Running Salt

1,675. *In one of your recent issues we recollect that you gave the name of the article which is used as an addition to salt for keeping it dry and in free condition for use as table salt.*

Would you be kind enough to inform us in which issue this information appeared, please? (London.)

This was supplied.

Beetroot Chutney

1,676. *Could you oblige me with a recipe for a beetroot chutney?* (Scotland.)

Details of one recipe, together with method of preparation, were given. After boiling the beetroots, they are plunged into cold water and skinned. The gum (say,

1 lb. to 50 lb. of beetroot) is soaked overnight in a gallon of vinegar and next day stirred well and then incorporated with another gallon of vinegar. Place in steam-pan and add the chopped-up beetroot, onions, chillies, lemons, salt, etc., and bring to the boil, stirring meanwhile. Simmer for about thirty minutes and bottle at not less than 180° F. The containers must be immediately sealed.

1,677. *Kindly supply manufacturing recipes for thick sauce, tomato sauce, and tomato chutney.* (Ireland.)

We have previously given recipes for these.

1,678. *In regard to your article in the August issue on Fruit Jellies, we shall be obliged if you can give us information on the following points:*

(a) *The name of a publication, if any, dealing with the subject.*

(b) *If it is possible to purchase samples of the containers illustrated in this country.*

(c) *The names of manufacturers, if any, of these containers in this country.*

(d) *The names of American manufacturers of such containers.* (England.)

This information was given.

Grapefruit

1,679. *Could you let us have some information on the vitamin value of grapefruit and of menthol?* (England.)

In order to gain the most up-to-date information on this subject, I would recommend you to apply to Dr. Kohman of the National Canners' Association, Washington, D.C., or to E. Gurin, Teacher College, Columbia University, New York.

These have carried out detailed investigations into the vitamin content of all the ordinary fruits, both canned and fresh.

In Miss Browning's comprehensive treatise published 1931, there is not very much on the subject. I am reproducing the references below.

"According to Willimott and Wokes (1926), fresh grapefruit and the extract obtained with 90 per cent. alcohol contain small but definite quantities of vitamin A, but the oil from the rind obtained by acetone extraction of air-dried material was practically devoid of the vitamin in 0·1 c.c. doses per rat."

"According to MacLeod and Booher (1930), the protective dose of fresh grapefruit is 2 gm. daily, while that of canned grapefruit is 2·2 gm. to 2·8 gm." This refers to vitamin C.

"According to Willimott (1926), vitamin B is present in considerable amounts in the fresh flavedo."

With regard to menthol, I cannot understand how menthol can be expected to have any vitamin content. Surely there must be a mistake.

Apple Pectin

1,680. *Can you give some details of the manufacture of pectin from apple pomace?* (England.)

The pomace must be of good quality and should not be stored for any length of time in a wet condition, as it is prone to deterioration.

The first step is to leach out the residual sugar and also the flavouring and colouring matter from the pomace by placing it in a wooden vat equipped with a perforated false bottom and outlet. Cold water is run through the mass until the soluble matter is extracted.

The washed pomace is then placed in an open vat, together with eight to ten times its dry weight of a 0·2 per cent. solution of citric, tartaric, or lactic acid (citric acid is probably best) and boiled for about forty minutes by means of an open-steam coil. Boiling for too long a period or at too high a temperature will diminish the setting value of the product. The material should be stirred continually during boiling.

The actual time of boiling will depend somewhat on the nature of the pomace. The quantity of water necessary in extracting will also depend on the quality of the pomace; there must be sufficient to give an extract which contains about 0·7 to 1 per cent. of pectin, and the boiled mixture of pomace and water should have the consistency of thin porridge.

Instead of an open vat, the extraction is sometimes carried out in a pressure retort or autoclave fitted with a mechanical stirrer. The pressure employed probably does not exceed 5 to 10 lb. on account of the danger of over-cooking.

After extraction, the mass is passed through a filter press or else filled into fabric bags which are subjected to pressure in a hydraulic press. The resulting cake may possibly be worth a second extraction, but not a third. This solid residue may be employed in the preparation of a cattle feed.

The liquid extract is clouded with a certain amount of starch and protein matter, from which it may be cleared by treatment at about 50° C. and at slight acidity with starch- and protein-destroying enzymes.

However, clarification can, if care is exercised, be effected by treatment with decolorising carbon and kieselguhr free from iron, coupled with filtration. It is possible that bentonite would be found effective for the same purpose. Some prefer to remove starch after filtration by enzyme treatment.

The resulting clear liquid is then concentrated until it contains 3 to 4 per cent. of pectin by means of a vacuum evaporator.

The reduction to a dry, powdered condition may be accomplished by precipitation from the extract by means of alcohol or acetone. Thus, the extract containing about 1 per cent. of pectin is agitated with twice its volume of rectified acetone in a closed vessel, and the resulting precipitate and its liquor are forced through a filter press. The press liquor contains about 60 per cent. of acetone and may be rectified. The precipitate is carefully dried and then ground (Morris).

Other methods suggested are precipitation by aluminium hydroxide (Wilson) and spray drying.

For further information on pectin reference may be made to—

Fruit Pectin. W. A. Rooker. New York. 1928.

Principles of Fruit Preservation. T. N. Morris. London. 1933.

"Manufacture of Pectin." C. P. Wilson. *Ind. Eng. Chem.*, p. 1065. 1925.

"Pectin: Its Occurrence and Manufacture" (including full bibliography). E. R. Nelson and H. H. Mottern. *Fruit Products Journal*, p. 138. 1931.

Citrus Juices

1,681. *Kindly give us your advice as to the best methods of preserving citrus juices and of packing for transport.* (Palestine.)

This was done.

1,682. *Please supply recipes and methods for manufacturing custard powder. I might add that I have taken* FOOD MANUFACTURE *practically since its infancy and have found matters of interest in its columns which have been of much assistance.* (England.)

The necessary information was supplied.

1,683. *Please advise us as to the best method of utilising partly bruised fruits and vegetables.* (England.)

Suggestions were made.

Banana Products

1,684. *Can you give us any information on banana products, such as banana flour?* (Africa.)

Banana Figs.

This term is applied to the dried whole banana. The fruit selected for the purpose must be ripe, so that the bulk of the starch has changed into sugar. Drying is carried out either naturally, in the sun, or artificially, in some form of drying plant, such as is used for fruit or vegetables.

In the former case, the peeled fruit is laid in rows on trays or in boxes, care being taken to avoid contamination by insects and dust. The fruit is covered up at night and in cloudy weather. Boxes or frames covered with glass can be used, provided that arrangements are made for free circulation of air in order to avoid condensation of moisture. The design of drying plant depends on a number of conditions, such as output, capital cost, labour, etc. In any case, it involves, in principle, subjecting the trays of fruit to a current of warm air. The trays may be arranged in tiers in the multi-compartment type of drier or they may be stacked on trucks which are run through the tunnel type of drier. Air circulation is best achieved by use of fan. The humidity is controlled by adjusting the relative proportions of recirculated and fresh air. Care must be taken to avoid raising the temperature above 140° F. The proportion of moisture in the finished product is commonly about 20 per cent. In order to ensure good keeping qualities, it should not exceed this figure, and should preferably be less.

Dried bananas which are sticky and have a dark colour are commonly marketed. Attempts have been made to improve the colour, and it is stated that good results have been obtained by slicing the fruit lengthwise and exposing it to the fumes of burning sulphur for twenty minutes before drying. Another point which would help sales is to see that the figs are more uniform in quality and size than is commonly the case. Also, dried bananas are usually received in this country in wooden boxes containing 28 lb. and 56 lb., but it would seem that there are advantages in packing the product in cartons with attractive labels. At all stages special precautions should be taken to avoid insect infestation.

Banana Chips.

These are made by thoroughly drying "green" bananas, and are of such hardness and consistency that they can readily be ground to flour. Fully grown unripe (or three-quarter ripe) fruit is peeled, this operation being facilitated by first immersing the fruit in very hot (but not boiling) water. The knives used are of bamboo, or of nickel or stainless steel.

The fruit, either whole or cut into slices, is then dried so that the product contains not more than 10 per cent. of moisture. The chips can be shipped quite satisfactorily in jute sacks. Weevils apparently do not get into the product, either during transit or in this country.

Banana chips must be of first-class quality, otherwise they are practically worthless. Inferior material can only be sold at low prices for cattle feeding.

Banana Flour.

This is prepared in the consuming country from imported chips. In Jamaica flour has been made direct from peeled bananas by drying them in a vacuum apparatus fitted with a system of rotating paddles and fixed knives. The disintegrated material so obtained was sieved and the coarse fractions ground in mills until the whole was reduced to the desired degree of fineness.

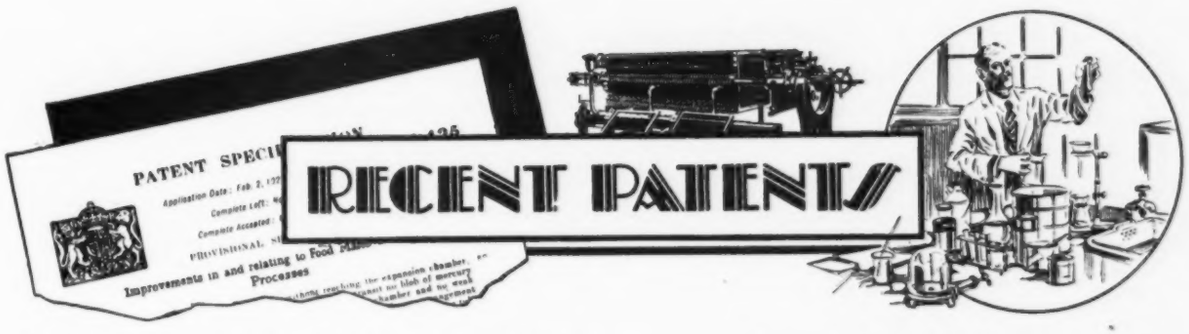
In Malaya the manufacture of banana flour was begun in 1924. After experimenting with different kinds of bananas, it was found that the plantain Pisang Tandok gave the best results. Apparently the true banana did not give a satisfactory flour. The fruit was peeled and cut transversely into slices $\frac{1}{12}$ in. thick. These were then arranged on wire gauze trays and partly dried in the sun, after which drying was completed in a hot-air drier depending upon natural air circulation. The time of drying was twenty-four hours, and the temperature was not allowed to exceed 120° F. (see F. S. Ward, ***The Malayan Agricultural Journal***, p. 138, March, 1930, for production costs and other data).

It has been stated that there is practically no market in this country for imported banana flour, for the following reasons:

1. Users require flour milled to their own specifications.
2. Imported flour is generally unsatisfactorily milled.
3. Chips are more conveniently shipped.
4. Flour may be adulterated.

There is, however, no reason why these difficulties should not be readily overcome.

Banana flour milled in this country is used almost entirely for invalid foods, biscuits, etc. A very small quantity is used in other proprietary articles. A few years ago efforts were made to popularise the use of banana flour in ordinary household cooking for cakes, biscuits, etc., but apparently this attempt has been unsuccessful. On the Continent, however, there is a greater demand, the flour being used for purposes other than the manufacture of foodstuffs.



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Latest Patent Applications

23130. WARING, J. N.: Preservation of edibles. August 10.

23332. BUCHTING, W. A.: Producing pectin from sugar beet. August 13.

23577. HARFURT, A. H., and MERMOUD, F.: Production of food products August 15.

23802. KRAFT-PHENIX CHEESE CORPORATION: Preparing concentrated casein. August 17.

23803. KRAFT-PHENIX CHEESE CORPORATION: Producing concentrated milk constituents. August 17. (United States, October 6, 1933.)

24651. HELMKE, W. A. C.: Treatment of coffee beans. August 27.

Complete Specifications Accepted

414,117. INDUSTRIKEMISKA AKTIEBOLAGET: Process of and apparatus for the manufacture of yeast.

414,252. CALEY AND SON, LTD., A. J., and PAYNE, A. G.: Chocolate and other confectionery, eggs and the like, and moulds for making the same.

414,334. RAMESOHL AND SCHMIDT AKT.-GES.: Manufacture of pressed yeast.

414,916. PROCTER AND GAMBLE CO.: Edible baked products.

415,147. SURE SEAL AND SUTAX, LTD., BARLOW, R., HUXLEY, J. H., and SUTCLIFFE, T.: Closures for cans, jars, and other receptacles for food.

415,179. DAVIDSON, G. N.: Treatment of fish offal, waste fish, or the like.

415,205. SWIFT AND CO.: Methods of stabilising fats and/or oils, and the improved product resulting therefrom.

415,251. REID, G. H.: Emulsifiers, particularly for making artificial cream.

415,303. SOC. R. MAUBAILLARCQ ET CIE: Preservation of fish by cold storage.

415,305. SMITH, I. W.: Devices for sterilising and drying fish and fish refuse for the manufacture of fish meal.

415,451. AUTO-DAIRY PIONEERS, LTD., and ENOCK, A. G.: Apparatus for the pasteurisation of milk and other substances.

415,638. TRES GYOGYSZER-VEGYESZETI IPARI ES KERESKEDELMI R.T.: Process for obtaining the pure germinal substance of seeds. (Cognate application, 846/34.)

415,656. ILLY, F.: Processes for preserving roasted or roasted and ground coffee.

Printed copies of the full Published Specifications may be obtained from the Patent Office, 25, Southampton Buildings, London, W.C. 2, at the uniform price of 1s. each.

Abstracts of Recent Specifications

Group Abridgments can be obtained from the Patent Office, 25, Southampton Buildings, London, W.C. 2, either sheet by sheet as issued on payment of a subscription of 5s. per group volume, or in bound volumes price 25. each.

411,308. **Powder preparation from glucose syrup.** DEUTSCHE STAERKE-VERKAUFS-GENOSSENSCHAFT. (Convention date, Germany, December 20, 1932.)

On mixing a very highly saccharified starch degradation syrup with one which is only saccharified to a moderate extent it has been found that evaporation of the mixture, preferably in vacuum, yields a product which can be conveniently marketed in powder form. This object can be achieved, for instance, by mixing 27 parts of thin liquor (20 per cent. dextrose) with 13 parts of thick liquor (60 per cent. dextrose). The dextrose contents are calculated upon the basis of syrup of 45° Bé.

411,611. **Yeast, alcohol.** STICH, E., 28, Werderstrasse, Mannheim, Germany.

In a process of obtaining yeast and alcohol from mashes containing sugar wherein the nutrient and air are added in individual phases depending upon the yeast growth, the period of working is divided up into short time intervals—for example, of from fifteen minutes to three hours—and amounts of air and molasses are supplied in each interval which are substantially the same as the quantity which would have to be supplied over that interval to secure strict accordance with the exponential growth curve, the air supply being limited to not more than ten times the quantity of mash to be fermented, and the aeration being effected with air in finely divided form. An example is given, the calculation of the amounts of molasses and of air supplied in each interval being explained in detail.

411,822. **Stabilising heat treatment for citrus fruit juices.** CALIFORNIAN FRUIT GROWERS' EXCHANGE. (Convention date, U.S.A., December 12, 1931.)

A rapid heating and cooling treatment for periods and at temperatures depending upon the type of juice, the *p*H and the concentration is claimed to render the juice immune to many undesirable changes, including "off" flavours, "cooked" flavours after concentration, discoloration, and undesired jellying. In the case of grapefruit juice, the treatment also prevents accentuation of the bitter naringin flavour. In general the process consists in heating the concentrated or unconcentrated citrus juice within a period of not more than two minutes up to 75° to 93° C., holding at this temperature for not more than three minutes and then cooling rapidly down to at least 45° C. A maximum temperature of 88° to 91° C. is mentioned in the case of pure orange juice with a *p*H of 3·73, and one of 84° to 90° C. in the case of mixed orange and lemon juice with a *p*H of 3·17. Plant for effecting these rapid temperature changes is described in detail. Example: Orange juice (*p*H not stated) is heated to 84° to 93° C. within 0·2 to 2 minutes, held there for 0·1 to 2–3 minutes, and finally cooled rapidly to 15°–20° C.

412,035. **Cereal preparations.** MYERS, H. C., 161, Dawlish Avenue, Toronto, Canada.

A dried fruit product is prepared by cooking a quantity of grain germ in an open cooking vessel in preferably five times its quantity of water for fifteen minutes to one hour and then dehydrating by continuing heating until the moisture is driven off or by subjecting to reduced pressure or by passing the wet mass through heated rolls. The drying is continued till less than 10 per cent.—preferably about 5 per cent.—of moisture

remains. The product is then ground. The ground material may be mixed up to the proportion of about 30 to 35 per cent. with liquid preparations such as cocoa, chocolate, or milk, or it may be converted into shredded, flaked, or granular form or mixed with other cereal preparations.

413,343. **Shortening with improved creaming properties.** SWIFT AND CO. (Convention date, U.S.A., August 22, 1932.)
The incorporation of an extremely minute proportion of a mono- or di-acid glyceride with any oils used as shortening has been found to improve their creaming properties as well as their mixing ability with other bakery goods ingredients. Thus the desired effect is achieved by incorporating 0·1 to 0·2 per cent. of the glyceride with the oil immediately prior to chilling and packaging. The same object can be achieved by feeding in glycerin with the deodorising steam, reaction with formation of a di-acid glyceride taking place at the temperature prevailing during this operation.

413,488. **Coffee tablets.** H. A. NEALE.
To enable the flavour and aroma of ground coffee to be retained indefinitely in the tablet form it is proposed to conduct all stages, including blending, roasting, and packing, in an inert (oxygen-free) atmosphere. Apart from preventing oxidation, which is a major factor in the deterioration in the flavour and aroma of roasted coffee, the presence of the inert gas reduces the quantity of occluded gases which would otherwise be liberated from the beans. The inert atmosphere can be provided by the gases arising during the actual roasting process, but is preferably supplied from a container of carbon-dioxide, nitrogen, or the like, and circulated throughout the plant. The roasted material may be tableted in the pure state or after admixture with chicory, oats, figs, etc. Tablets should preferably be of a size sufficient for one cup of coffee. A pressure of 1 to 3 tons per square inch during tableting is required to produce sufficient hardness to withstand ordinary commercial handling conditions. Any of the commercial wrapping materials impermeable to gases are satisfactory for packaging the tablets, although in the case of transparent cellulose wrapping a thicker coat of lacquer should be applied than is customary in the case of ordinary "moisture-proof" wrapping.

413,816. **Plant for accelerated chocolate manufacture.** H. DAUS.
A machine is described for simultaneously carrying out all the customary operations of chocolate making. Cocoa nibs, crystal sugar, cocoa butter, and other ingredients are simultaneously introduced into a rotatable drum in the interior of which are loosely placed a number of heavy metal rollers. Three of these rollers are recommended, one of which is superposed upon the others. Mixing and grinding are further improved with the aid of a series of metal protuberances arranged at intervals round the floor of the drum. Heating can be effected by gas jets or by steam or water coils. Chocolate of very fine texture is claimed to be obtained in this plant after the relatively short mixing and grinding period of twenty to twenty-five hours.

ODOUR OF GELATINE

To be or not to be?

"MAKE this test yourself," said Standard Brands to the readers of its American magazine advertising for "Royal Gelatine." The test consisted of dissolving in warm water, when the "fresh, fruity odour" of "Royal" was to distinguish it from inferior grades. "Royal," moreover, was straw-coloured owing to the practice of maturing in wood.

But General Foods felt that aspersions were being cast at their water-white, and therefore "pure," gelatine, the solution of which in warm water was quite odourless, and took umbrage at the implication that "Jello" was less palatable than "Royal."

Rumour has it that each side threatened to cancel its advertising in journals carrying the other's ads., but the ability of publishers to restore peace in advertising is attested by the fact that both General Foods and Standard Brands schedules continue intact.

Important Information on Cattle and Beef from Economic Committee's Survey

No less than 80 per cent. of the beef and veal entering world trade is absorbed by the British Empire, but only about 20 per cent. of the whole traded amount is of Empire origin. This is one of the central facts thrown up by the Imperial Economic Committee's world survey of production, trade, and consumption of Cattle and Beef. The Survey appears at a time when the condition of the beef trade is attracting general attention.

The world's cattle numbers have increased by 10 per cent. since 1913, but there has been a heavy decline in beef production in exporting countries. The world's trade in cattle has suffered substantial shrinkage, and the world trade in beef has dropped by as much as 40 per cent. since 1925.

The world's exports of chilled beef, which exceeded 400,000 tons in 1933, come almost entirely from Argentina, which furnished about 85 per cent. of the whole in that year, the bulk of the balance being supplied by Uruguay (7 per cent.) and Brazil (6 per cent.). Southern Rhodesia exported rather less than 2 per cent. of the total.

The world's exports of frozen beef, which aggregated 210,000 tons in 1933, come principally from Australia (34 per cent. in 1933), New Zealand (22 per cent.), Argentina (15 per cent.), and Uruguay (14 per cent.). British Empire countries as a whole supplied about two-thirds of the world's exports in 1933, their share of the declining volume of this trade having increased appreciably in recent years.

Great Britain is virtually the sole market for chilled beef, and the most important market for frozen beef, with the result that she now takes over 80 per cent. of the world's exports of these two categories.

Falls in beef consumption occurred in all the principal consuming countries, but a slight upward trend was perceptible in Argentina, New Zealand, the United States, France, and the Netherlands in 1932.

The decreased supplies in Great Britain have resulted in a more favourable price position for beef than would otherwise have been the case. Compared with those of many commodities, beef prices have been well maintained since the post-war slump and are still above the pre-war level, except frozen beef, which is slightly below.

In their efforts to attain greater self-sufficiency as regards meat supplies, beef-importing countries have placed restrictions upon their imports of beef and cattle by means of quotas, import duties, and regulations. These measures have succeeded in drastically curtailing such imports and in increasing the domestic supplies of beef, but in the importing countries the net result has been a lessened consumption of beef.

In regard to Empire prospects in the chilled beef trade, successful experimental consignments from several Empire sources have already been made, but before the trade can assume substantial proportions much remains to be done. Chief among the problems awaiting solution by the organisers of this trade are the more rapid maturity and up-grading of the stock, and their efficient transport to the abattoirs and from the abattoirs to their final destination. Meanwhile, the United Kingdom will have to rely upon the South American countries, particularly Argentina, for the bulk of her imported beef supplies for some years to come.

Any notable increase in total demand in the next few years appears unlikely unless general economic conditions materially improve, but, in any event, the principal producing countries are quite capable of satisfying it after a short period under favourable conditions of demand.